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Planning and operation of transport systems in Mediterranean Mid-Size Metropolitan Areas

(Lisbon and Homs as a case studies)

Majd Chaker Murad

Dissertação orientada pelo Professor Doutor Fernando Nunes da Silva

Mestrado em Ordenamento do Território e Urbanismo

Março 2021

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List of abbreviations:

OECD: The Organization for Economic Co-operation and Development

TOD: Transit-oriented development

MAAS: Mobility As A Service

SEA: Strategic Environmental Assessment

EIA: Environmental Impact Assessment

MDF: Mediterranean Development Forum

LMA: Lisbon Metropolitan Area

FUA: Functional Urban Area

DG MOVE: European Commission Directorate-General for Mobility and Transport

LPG: liquefied petroleum gases

PROSPECTS: Procedures for Recommending Optimal Sustainable Planning of European City Transport Systems

STRIA: The Strategic Transport Research and Innovation Agenda

PCFV: Partnership for Clean Fuels and Vehicles

GFEI: Global Fuel Economy Initiative

UNEP: United Nations Environment Program

ITS: Intelligent Transportation Systems

AULT: The Arab Union of Land Transport

TSPs: Transport Service Providers

Abstract

Urban sustainability, economic performance and tourist attractiveness require a comprehensive and efficient functioning multimodal transport system. In recent centuries, the importance role of urban transport and its means were not a result of urban growth, since the inception of cities; it has been a major junction of the city.

More efficient urban transport would allow cities to ensure better accessibility to the various services. At the same time, they should help reducing the transport externalities such as traffic congestion, road crashes and environmental pollution.

In the 1995's Barcelona Conference, where transport was identified as a priority issue, a broad consensus points out that transport reform should be an integral part of economic adjustment at the national level as well as intergovernmental cooperation at the regional level.

The idea of this dissertation inspired by me as a student. Portugal is my first abroad country, I felt it as my second country, as it is a Mediterranean country as well as Syria. At the same time, I felt that my responsibility is to contribute to its development and improvement in all aspects, to have an organized and sustainable transport services, that ensures mobility and basic access to meet the needs of development without affecting the quality of life for subsequent generations. So, it must be safe, healthy, inexpensive and with less impacts regarding pollution and the use of renewable and non-renewable resources, it should meet the needs of the present without affecting or damaging the environmental harmony and the need to achieve a long-term sustainable economy and convenience for society.

The objective of this research is to identify some specificities of cities in the Mediterranean region that can somehow explain the existing difficulties they show regarding the efficiency of their transport systems, the growing predominance of car use, the delay to improve active modes of transport, as well as the transport policy reforms, they are trying to implement. The similarities between Lisbon and Homs in this regard were used to better understand the problems that those cities face and what are the strategies to explore in order to reach a more efficient and sustainable transport system.

In most of the southern Mediterranean countries transport reforms are now underway but does not have an identity yet comparing with the northern countries. However, I am taking Lisbon's transport policies and urban mobility management as a case-study, to identify the policies and measures that can be applied in Homs, helping this city to plan more efficiently its transport system.

As a result, an interaction exists between transport system and its use, as they influence each other. I'm focused in this dissertation on the user perspective. Methods were used that focus on the people and reveal his thoughts, knowledge, experience and feelings and how the world is going forward.

Keywords: Transport planning, Transport system, Urban policies, Transport system operation, Urban mobility, Mediterranean cities, Homs, Lisbon.

Resumo

A sustentabilidade urbana, o desempenho económico e a atratividade turística exigem um sistema de transportes multimodal, abrangente e eficiente. Nos últimos séculos a importância do papel do transporte urbano e dos seus meios não foram apenas o resultado do crescimento urbano, antes o influenciaram desde o início das cidades.

Um transporte urbano mais eficiente permitirá às cidades garantir uma melhor acessibilidade aos vários serviços. Ao mesmo tempo, deve ajudar a reduzir as externalidades dos transportes, como congestionamentos, acidentes rodoviários e poluição ambiental.

Na Conferência de Barcelona de 1995, onde o transporte foi identificado como uma questão prioritária, um amplo consenso apontou para que a reforma do transporte fosse parte integrante do desenvolvimento económico ao nível nacional, bem como exemplo da cooperação intergovernamental ao nível regional.

A ideia desta dissertação inspirou-me como estudante. Portugal é o primeiro país estrangeiro em que vivi, senti-o como o meu segundo país, pois é um país mediterrâneo tal como a Síria. Simultaneamente, senti que a minha responsabilidade é contribuir para o seu desenvolvimento e melhoria em todos os aspetos, para ter um serviço de transporte organizado e sustentável, que garanta a mobilidade e o acesso básico para atender às necessidades de desenvolvimento, sem afetar a qualidade de vida das gerações futuras. Para isso tem de ser seguro, saudável, barato e com menor impacte em termos de poluição e no uso de recursos renováveis e não renováveis, atender às necessidades do presente sem afetar ou prejudicar a harmonia ambiental e a necessidade de alcançar uma economia sustentável a longo prazo e conveniência para a sociedade.

O objetivo desta pesquisa é identificar algumas especificidades das cidades da região do Mediterrâneo que possam de alguma forma explicar as dificuldades existentes quanto à eficiência dos seus sistemas de transportes, o crescente predomínio do uso de automóveis, o atraso na melhoria dos meios de transporte ativos, como bem como as reformas da política de transportes que estão a tentar implementar. As semelhanças entre Lisboa e Homs neste aspeto, foram utilizadas para melhor compreender os problemas que essas cidades enfrentam e quais as estratégias a explorar para se chegar a um sistema de transportes mais eficiente e sustentável.

Na maioria dos países do sul do Mediterrâneo, as reformas dos transportes estão agora em andamento, mas ainda não apresentam uma boa eficiência quando comparadas com os países do Norte. No entanto, considero as políticas de transporte e gestão da mobilidade urbana de Lisboa como um estudo de caso, para identificar as políticas e medidas que podem ser aplicadas em Homs, ajudando esta cidade a planear de forma mais eficiente o seu sistema de transportes.

Como resultado, existe uma interação entre o sistema de transportes e o seu utilizador, dado que estes se influenciam mutuamente. Nesta dissertação centro-me na perspetiva do utilizador. Foram utilizados métodos que se focalizam nas pessoas e revelam os seus pensamentos, conhecimentos, experiências e sentimentos e como o mundo progride.

Palavras-chave: Planeamento de transportes, Sistema de transportes, Políticas urbanas, Operação do sistema de transportes, Mobilidade urbana, Cidades mediterrânicas, Homs, Lisboa.

1. INTRODUCTION

The “Mediterranean city” gained interest and recovered a symbolic centrality. But this centrality conceals the risk to create an ideal model of Mediterranean settlement, unreal and too much abstract to be useful. Nevertheless, the theme is so wide that the same significances of “Mediterranean” and “city” concepts are not completely definite. Working on these definitions could be an important result.

This thesis does not pretend to answer all open questions but aims to initiate further analysis of urban cities in the Mediterranean region. In this sense, what follows is not about how cities develop and change, but an invitation to change paradigms carefully. I look to the past with decidedly contemporary eyes, and with the primary goal of enhancing our practical and theoretical understanding of the most recent episode in the transport products in the Mediterranean urban spaces.

Mediterranean Countries:

At least 20 countries are considered "Mediterranean". The Mediterranean countries include Albania, Algeria, Bosnia and Herzegovina, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Lebanon, Libya, Malta, Morocco, Monaco, Montenegro, Slovenia, Spain, Portugal, Syria, Tunisia, and Turkey. But in my thesis, I focus on the successful practice in some countries of Europe and some of the Mediterranean cities.

Until recently Homs’s urban transport sector was characterized by major institutional, regulatory, and operational weaknesses. As a result, public transport systems still perform poorly and are not responsive to the global sustainability and to the changing demands of the population. Lisbon, the capital city of Portugal, has a smart city strategy that places its residents and their needs at its core. Nowadays, the planning of transport takes an increased significance. So, the Government of Homs has embarked on a broad program of activities aimed at systematically addressing issues, particularly the structural issues that are at the core of the current inefficiencies. In order to do so, an evolving study of Syrian and Portuguese decision-making processes is done. The dissertation deals with the differences and similarities of Homs and Lisbon decision making process in transportation planning, following the issues cited in Transport Research and Innovation Monitoring and Information System (Procedures for Recommending Optimal Sustainable Planning of European City Transport Systems) (PROSPECTS) and The Organization for Economic Co-operation and Development (OECD).

1.1. Background and motivation

The transport system can be considered as a complex adaptive system, so decisions on transport planning processes are unavoidably complex. Moreover, decision making today is not an intellectual process, but a socio-political and organizational process, whereby the interest has shifted from the quality of the decision towards the quality of decision making (Monitoring urban development for environmental sustainability in Portugal, 2007) and expecting the effects of any decision may be difficult and are sometimes clear prediction.

However, I notice that the most current transport systems around the world are unsustainable, in terms of growing levels of congestion, pollution, fuel consumption and accidents.

The best will depend on which reducing congestion, strengthening the economy, stimulating healthier lifestyles, improving the environment, and protecting those who are disadvantaged.

To analyze the transport planning policy, a study with Portugal has been undertaken. Portugal constitutes an interesting case for an analyzing study in an EU context. It has received support from European Funds for its infrastructure development for more than two decades.

I choose the Mediterranean region regarding to historical cultural heritage, cities on the southern and northern shores belong to the oldest in the world and represents one of the rich traditions of architecture, urban development and municipal administration.

There are fundamental differences between northern and southern countries but there are common aspects as they are facing demographic pressure and rapid urbanization. Also, it is a region of trade that create a certain culture, a few things that are influencing transport and urban mobility nowadays. Climate, that make walk a preferable choice, meanwhile the northern countries it is much more difficult, the soft mode of transport is in a good climate condition, the other aspect is the social behavior that is so clear, we do not cheer public places like Nordic countries that they are depending on individualistic, so when we are willing to improve public transport, we have to fight for a certain culture individuals, because we are in a very recent motorization, we are most of the families generate have a car, I cannot use car in centers or in historical centers, people reject that, these a cultural critical of Mediterranean people, they are in the car age.

The problems of the Mediterranean are similar. We do not know exactly what is the law, they are always interpretation of the law and our people have a lot of imagination to find exactly what is interesting in

certain law for their own purposes. The other aspect is associated to safety; as medium classes are afraid to use public transport or do not feel comfortable with them because they are not in a good shape.

The role of tourism is very important for transport demand, namely for sightseeing. So, transport system needs to provide an extra offer in a certain season of the year. At least during 4 months it needs to provide alternative modes for these extra flows of demand.

Indeed, it is important to understand the proceeding of decision-making and making policies processes with respect to transport planning. Especially I have an experience in the both transport systems. I have analyzed the two cases with respect to these issues to identify examples of good practice of Portugal for the Syrian case.

i) Concept of urban transportation (Urban transport and Collective transport)

Urban transport is a complex of technologies, facilities, and infrastructure and means, that aim to facilitate the movement of individuals and goods in the free environment in optimal conditions of time, cost, comfort and safety, so urban transport includes, collective transportation (bus, subway, train ...etc.) as well as the individual transport (private car or bicycle).

Although urban transport includes the movement of people and goods, I will only be concerned with the movement of people, as the movement of individuals in the urban environment is related to the extent of the distribution of urban activities and how the urban space is used, in addition to other factors such as tension, frequency, income level, population density and level of development and technology.

There is a human need for transportation since a long time ago, moving from one place to another searching for essential things in life.

Over the years , due to the civilizational and urban development in the world's cities, including Arab countries, has led to the emergence of many urban problems, including urban transport problems, mainly represented in street congestion, traffic jams, traffic accidents and environmental pollution (emissions of pollutants and particularly Greenhouse Gases, and all the others impacts such as noise and barrier effects as a visual pollution) , With the growing negative effects of environmental impacts due to urban transport systems and mobility, preoccupations with a more sustainable urban mobility become a priority agenda in many countries, developed and underdeveloped.

Transport is one of the most important sectors which plays an essential role on the economic, social, and urban levels of all developed and developing countries.

ii) Public policies in urban mobility

Public transport:

During recent years' transport issues have become much more prominent on the public agenda. They have gained considerable, if intermittent and selective, attention from the media. Three aspects have come to the fore. One is the impact of traffic congestion and pollution on our towns and cities, and on our health and particularly that of our children. A second is the environmental impacts of major road - building schemes and the controversy about their effectiveness in relieving (or generating) congestion (Wood.QC, 1994). The third is, of course, the long - term effect of the unrestricted use of cars on the global environment (Royal Commission on Environmental Pollution, 1994; Stopher & Stanley, 2014)

Urban mobility involves cultural and political factors of the contemporary society, "whether in a structured or behavioral way". Recent studies point out that public policies and measures related to urban mobility should be aimed at stimulating the use of collective transportation and active forms of mobility. Therefore, such studies would be also contributing to good social and environmental practices in cities.

1.2. Objectives

The primary purpose of this thesis is to formulate and illustrate a methodology for analyzing and comparing available modes of public transportation in Homs, taking Lisbon as a model. The underlying objects are: to identify the good practice and useful application in Lisbon to be followed and applied in Homs, demonstrate the diversified requirements, to communicate the various obstacles to overcome, to identify the critical assumptions that need to be made, and to identify means for improving public transport in Homs. The results can be used by transportation planners and new town developers, to identify and estimate the costs and first step to do.

General objectives:

- Understanding the reasons that led to the absence of an efficient planning and operation of public transport systems in Homs.
- Explore the similarities and differences of two mid-size metropolitan areas in a Mediterranean context, taking Lisbon and Homs as case studies, identifying their common problems and the ways they are proposing to overcome their insufficiencies, both in the transport system and in its relation to spatial planning.

- Analyze and study the ability to promote a more sustainable urban mobility in Homs.
- Identify, organize, and disseminate best practices and processes, and evaluate the role of strategic projects.

Specific objectives:

- Integrated analysis of planning requirements for a public transport system that responds efficiently to current and future needs of the population.
- Understand how urban planning could affect the evolution of the transportation system and the tools used to influence its development.
- Comparing and studying the transportation system in Lisbon with Homs.
- Analyze the current situation of Homs and propose a strategy to improve the public transportation system.

1.3. General outline and thesis structure

This thesis has a general outline as described in figure 1.1 and contains introduction, theoretical bases are used as the bases to formulate sustainable public transport application in Homs by using the sustainable public transport model in Lisbon, this thesis tries analyze available application according to the Mediterranean's transport problems in the med size metropolitan areas. Finally, it concludes all of the findings.

This thesis general outline is composed in thesis structure as follows:

Chapter 1, this chapter consists of background of this research and motivation and the objectives of thesis.

Chapter 2, the objectives in general and specific.

Chapter 3,4 and 5 the theoretical framework contains literature reviews which are relevant to use for the analysis with polices.

Chapter 6, empirical study describes the existing condition of Lisbon and Homs concerning their features, population, areas, transport services and application, and provides the analysis based on theoretical framework in chapter 3,4, and 5.

Chapter 7, this is the conclusion answering all the research questions and recommending for further research.

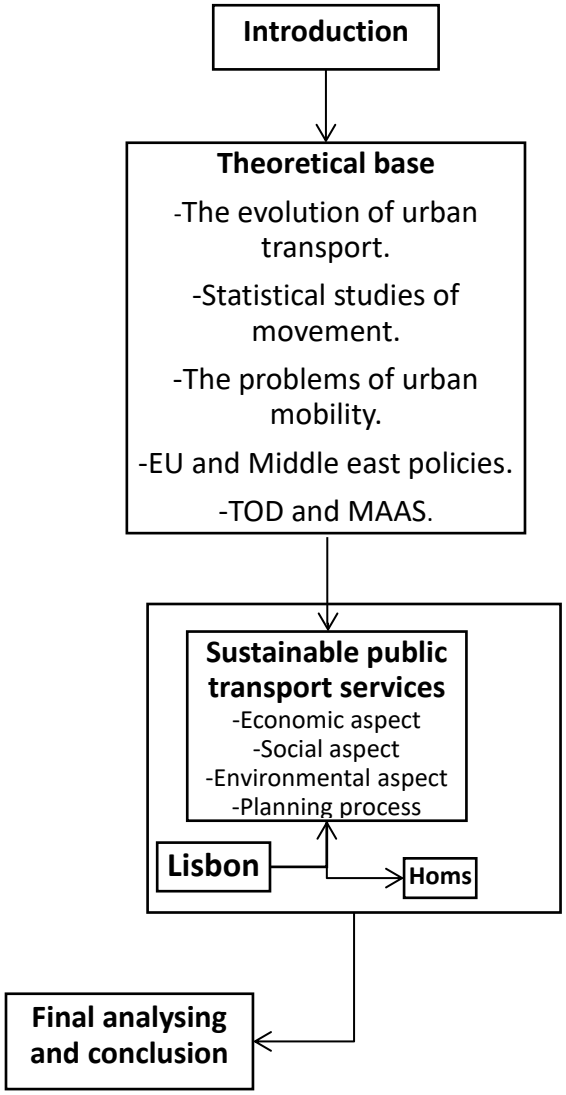


Figure 1: General Outline

2. METHODOLOGY

This chapter outlines the methodological process and covers the research design, literature review, the data collection and analysis process.

Transportation is not a science; it is a field of inquiry and application. Two common features of transportation studies, are their heavy reliance on empirical data and the intensive use of data analytic techniques, ranging from simple descriptive measures to more complex modeling structures.

The methodology used to characterize the transportation systems in mid-size metropolitan areas, and to identify the good practice in Lisbon and technical guidelines and evaluations developed by international entities in the domain that it may be applied in Homs, their relation to spatial planning, and how it could be improved for a more sustainable mobility. From that and considering the specificities of Homs and the results in Lisbon, a strategy to improve the transport system in Homs will be presented and discussed.

I decided to review the following documentation: reference transport planning application from the past to recently Portugal and Europa, papers related to development of transport system in Mediterranean countries at a local level, and study of the particular conditions of a mid-size Metropolitan city.

Note: I used APA style for cite the references.

2.1. Specific methodology

- Pick up what are the main problems (from the specific literature and technical documents) and recent revolutions namely in terms of modal share and number of daily trips inhabitants and the purpose of this trip.
- Look for the metropolises in the Mediterranean, what are the sizes of these cities and their population.
- Characterization of the two metropolitan areas and their transport system, both in present days and their recent evolution.
- What are the problems facing by these metropolitan areas, through a table to compare between their main indicators?
- Make a summary of analysis and proposals of OECD cities to have an idea of general statistics and policies and see the similarities.

- After that I can make a critical analysis of the main polices and main projects under way at the European level and local and to see the changes in terms of use the private car, public transport, pedestrian and bicycles.
- Doing analysis of TOD and MAAS, as references of the transport policy.
- Definition of a new concept for the transport system in Homs and the strategic projects that could materialize it.
- Applying the results of other studies by which these forecasts could be adjusted to allow for the effects of other policies.

For these I aim to know the detailed facts about the reality and state of the transport network that is provided by OECD, TOD and MAAS within the city and the quality of the service provided to its residents.

2.2. Thesis design and process

The thesis design corresponds to how the study is designed to be able to answer the thesis questions and its aim to be applicable in Homs. It can also be understood as the overall plan, including a strategic framework for how the study is executed and justified. (Mafuwane, 2014)

In addition, the MAAS concept and sustainable transport is a relatively new phenomenon within the transportation industry in Homs that has not yet been generally established and still lacks a long-term sustainable business model. Therefore, a study with a qualitative and quantitative thesis strategy has been chosen due to the complex nature of the subject. The deductive approach from Lisbon as a model has a common similarity with Homs (area, population, social features, and weather as a Mediterranean cities), and survey tool will enable the opportunity to know the different point of view and experiences of differ people within the area to gather soft and rich data, which is preferable in a case study categorized of complexity. Therefore, this strategy a choice of a quantitative and qualitative research study is suitable in this case since specific amounts of data would reduce the complexity and find the most preferable useful solutions.

Next, adequate theoretical frameworks will be chosen to be able to analyze the collected data and empirical findings. The underlying reason of using a deductive research approach is that other case of study of Lisbon that have been performed within this field have been trying to theoretically depict how

the sustainable transport and MAAS system could and should be designed. However, a theory has to be included in this study since it can provide an answer to different phenomena that are attached to this concept. Therefore, an increase of trials has to be performed in a real life-setting to be able to detect all factors that influence this concept(survey). Due to these factors, this study will have its primary focus on the empirical findings, but it will include different theoretical frameworks to be able to analyze various phenomena that have been identified in the case study of Lisbon.

2.3. Data analysis method

As Miles and Huberman (1994) mention, there is a long list of different data analysis approaches that can be used when drawing and verifying conclusions. In order to see things and their relationship more abstractly the following tactics were introduced subsuming particulars into the general, I select comparisons to sharpen understanding, partitioning tables to see differences.

The public transportation and the methodologies of policy and decision-making process are online, because information by this means is permanently updated. I also obtained digital copies of National and regional plans through the educational institutions (Al Baath and Damascus university in Syria) to which I am attached. The most used literature databases are made using the research resources provided likewise by the universities, due to the lock down of Corona Virus, all the data are based online.

Graphs and matrixes were used in this study to analyze and display the collected data so that conclusions could be done. Graphs were used in analyzing the gathered data from online questionnaire and the collected matrix was used in processing and analyzing data from the internet web pages, books, thesis, and journals.

2.4. Data collection

This chapter aims to provide an understanding of how I structured the questionnaire, and lastly how gathered empirical data was analyzed, to provide an overview of existing and planned transport strategies in both cities Lisbon and Homs, this was carried out mainly through digital data of my university and/or Ministries of Transport.; to analyze how people react with the strategies and policies; and to define good practice through case study Lisbon, These highlighted very different aspects of environmental, economic, social and policy.

2.4.1. Questionnaire

Questionnaires are the most common way of gathering data from a sample of individuals. Using a questionnaire approach was chosen by me instead of interviews, to know more about the different transport modes users' experiences during the day for Homs's people (50%general users, 35%students, 5% families, 5% businesses, 5%others) and how they will work with the sustainable transport concept, the number of people that answered were 375 persons, therefore I can evaluate well and extract results.

The use of a questionnaire allows me to ask for follow up questions to receive a more detailed explanation on specific phenomena, especially establish it on Facebook, nowadays is our small community, using Arabic language to ask, that make easier for all strata of society to participate. Since transportation's questionnaire participators answered questions differently, the google questionnaire on Facebook allowed me to distinctly ask for questions and clarify some points that I faced when I was in Homs, to make a full understanding about the situation, that made it possible to get in-depth answers on topics that I found interesting. Besides, depending on what was asked in the questionnaire, I did not follow a specific pattern when asking questions, on the contrary, questions were asked in a different important needed aspect. Lastly, all questions were phrased to fit into the context of all participators.

2.4.2. Selection of questions

Following Matthews & Ross (2010) designing the questionnaire is the most important stage in this type of research because once the questionnaire is designed the researcher has determined the questions and the answers and he will not be able to go back and get further information. I need to be certain that the questions I ask are going to enable gathering of the needed data.

The questions were selected based on people needs of transportation for now and for future generations. A questionnaire is designed to collect a number of different types of data including: facts- about people or events, descriptions-people's descriptions about something that, for example, has happened to them, knowledge-what people know about something, opinions-what this opinion is about they have experienced or know about, attitudes/values-their attitudes toward other people, institutions, ideas and so on, and background information about the respondent which may be linked to the research topic (Matthews & Ross, 2010).

Questionnaire contains these types of questions :

- Checklists provide a list of items, and the participant is asked to check those that apply in the situation, this kind of questions are used to determine the problems of using public transportation and find the applicable needed solutions.
- Two-way questions limit answers to a pair of alternative responses (yes and no), this kind of questions are used to know their reaction of using a new approach of transport system (MAAS), and to know if they are satisfied of using public transport.
- Multiple-choice questions provide several possible answers, and the participant is asked to select the one that is most applicable, this kind of questions are used for the basic information for instance gender, age, education level, and location.

I select these types because they will result in the specific data needed, to know the extent of your satisfaction with the use of public transport in Homs, and the result is a basis and an indication to improve public transport services.

3. THEORETICAL ROOTING OF TRANSPORT AND ITS ROLE IN STRUCTURING URBAN SPACES

There is a need for urban planning that can meet many challenges facing development, especially in areas with a steady increase population growth, and the accompanying increase in demand for services and the provision of resources for that. The City Development Strategy is a planning approach that responds in a dynamic way to the challenges related to rebuilding and formulating urban objectives within new principles, ideas and modern tools that fit the challenges and growing requirements of our world.

Transportation is considered as a part of economic, social and service activity, which aims to facilitate the movement of people products from one place to another using different modes of transport according to the demand of social requirements to meet the needs of the people, and Expanding urbanization, and facilitating the exchange of experiences of social life and civilizational communication.

During the past fifty years, there is a great increasing to own private vehicles in the developed world, this leads to the phenomenon of urban expansion, and workers can live at a distance from their working places, especially after the tremendous development of the public transport system.

3.1. The evolution of urban transportation

Cities are seats of government and centers of human activity. Also, they are central locations for trade, manufacturing, cultural, educational, and other activities. However, before the development, most people resided in rural areas were worked in the agricultural sector. The people's lifestyles were completely changed by the industrial revolution, which was initiated and sustained by many institutional, economic, and technological developments during the eighteenth and nineteenth centuries.

The invention of the steam engine by James Watt around 1765 is a symbolizing the beginning of the industrial era, it represents a significant technological breakthrough: it created a practical means of obtaining mechanical energy for application in mining, manufacturing, and, somewhat later, in transportation.

The impact of these development upon urban patterns was first evident in the rapid growth of the centers of international trade and commerce that began at the end of the eighteenth century. These centers London, Paris, Berlin, New York, and others grew throughout the century, and in most countries this growth has continued to the present.

The pressure for internal travel became increasingly important for the growing cities and led to many efforts toward inventing new urban passenger transport modes. Numerous attempts failed, but the successful ones had direct and very significant impacts on cities.

"The development of the dynamo and electric motor during the 1870s, through the inventions of Werner von Siemens (1816–1892), Z. T. Gramme, C. F. Brush, Pacinotti, and others formed the basis of a new industry associated with the generation and distribution of electricity for arc lighting and (after 1879) incandescent lighting. As early as 1855, several European inventors had conceived the idea of using continuous conductors to convey centrally produced electricity to rail-guided vehicles, and the new electrical industry provided the means for the realization of such a scheme.

In 1879, Siemens' firm, Siemens & Halske, built a demonstration electric railway for the Berlin Trade Fair, and two years later the world's first electric streetcar line, developed by the same firm, opened

at Lichterfelde near Berlin. For both lines, the running rails were used as positive and negative conductors; a similar railway opened at Brighton (England) in 1883. The use of exposed conductors on a public street was obviously unsatisfactory, and it was clear that fencing off the line for safety (as was done at Lichterfelde) would severely restrict the range of places in which the new invention could be applied. Electrification of tramway lines, therefore, proceeded very hesitantly at first, with much effort being spent in the search for a safe and reliable method of the current collection.

Siemens & Halske took a leading part in this work. For the Paris Exposition of 1880, they equipped a line with an overhead copper-wire conductor, which was set inside a slotted pipe.

In the same year, Siemens & Halske tried small contact carriages running on grooved wheels along with a pair of overhead wires on an experimental line at Charlottenburg. But it was in America that the really fruitful technical development—the ‘‘breakthrough’’ in streetcar technology—will occur. “ (Vuchic, 2007)

Since the automobile arrived the infrastructure has been adapting to our travel behavior and spatial constraints have been relieved. During the growth of the car-industry, urban development in the outskirts of cities has been made available at the cost of congestion, increased emissions, and parking problems (Alessandrini, Campagna, DelleSite, & Filippi, 2015). From increased car use new industries have developed, and automobiles and transports have become important growth indicators in today’s economies. Present infrastructure ideals promote the car as the primary means of transportation (Norman, 2019) and the system of the automobile has become a system that enhances its own strength (Urry, 2004). This has led to difficulties of changing the role of the car and the way the society is built. Usually, the car is only used during a fraction of the day and mostly during peak hours (Alessandrini, Campagna, DelleSite, & Filippi, 2015). As opposed to the public transport, cars are parked just outside the door, more journeys are made available and people can leave whenever they want, causing a greater sense of freedom (Urry, 2004). Public transport on the other hand doesn’t operate everywhere, runs after a timetable and stops only at pre-decided locations (Norman, 2019). Thanks to flexible door-to-door transports, the car has become a status symbol (Alessandrini, Campagna, DelleSite, & Filippi, 2015). Transports are rarely the goal, but rather a means to get to an activity. Therefore, travel times affect the possibility for people to perform the desired activity, where the car most times is the faster option in rural areas. Vehicles that don’t need a driver has been discussed since the mid-1900s (Shladover, 2017). The air traffic has the autopilot and there are subway trains in Copenhagen (Metro Service, 2018) and Singapore (Government of Singapore, 2015)

operating without drivers. Though total automation (automation level 5) has not yet been reached for regular road vehicles, but only for other transportation modes.

3.2. Urban movements in cities (statistical analyses)

In this chapter I characterize the Mediterranean urban structure and cities,

i) Population density and urban centers in the Mediterranean:

The total population of the Mediterranean countries grew from 276 million in 1970 to 412 million in 2000 (a 1,35 % increase per year) and to 466 million in 2010. The population is predicted to reach 529 million by 2025. Four countries account for about 60 % of the total population: Turkey (81 million), Egypt (72 million), France (62 million), and Italy (60 million) (Population density and urban centres in the Mediterranean basin). Overall, more than half the population lives in countries on the southern shores of the Mediterranean, and this proportion is expected to grow to three quarters by 2025 (UNEP/MAP/MED POL 2005). The Mediterranean region's population is concentrated near the coasts. More than a third live in coastal administrative entities totaling less than 12 % of the surface area of the Mediterranean countries. The population of the coastal regions grew from 95 million in 1979 to 143 million in 2000. It could reach 174 million by 2025 (UN/MAP/BP/RAC 2005). The concentration of population in coastal zones is heaviest in the western Mediterranean, the western shore of the Adriatic Sea, the eastern shore of the Aegean-Levantine region, and the Nile Delta. Overall, the concentration of population in the coastal zone is higher in the southern Mediterranean countries. This is also where the variability of the population density in the coastal zone is highest, ranging from more than 1000 people/km2 in the Nile Delta to fewer than 20 people/km2 along parts of coastal Libya. (Population density and urban centres in the Mediterranean basin)

I focus in my studies in the med-size Mediterranean cities, and regarding to some of the statics EU cities that have a successful experience in transport system, and are available on EU platform.

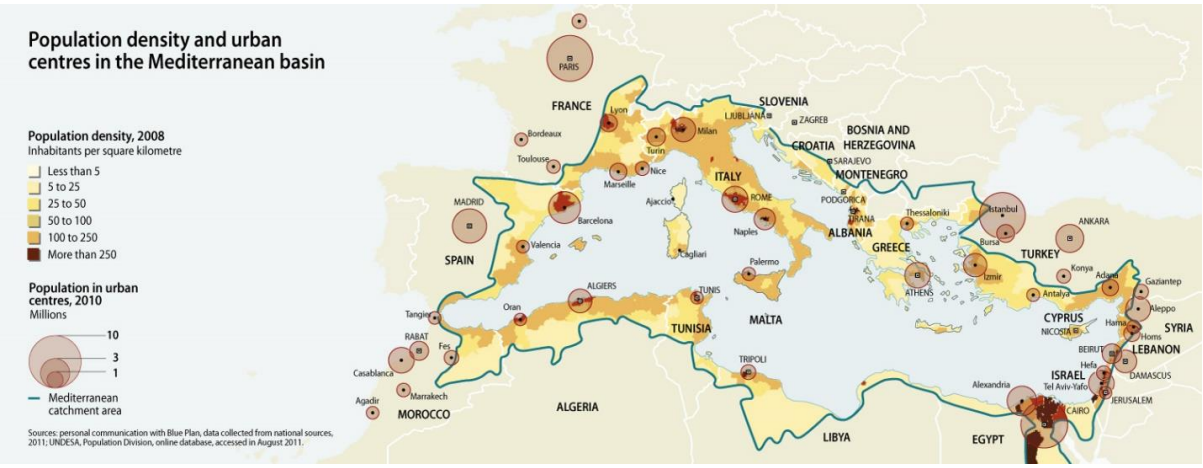


Figure 2 The population density and urban centers in the Mediterranean
Source: (Population density and urban centres in the Mediterranean basin)

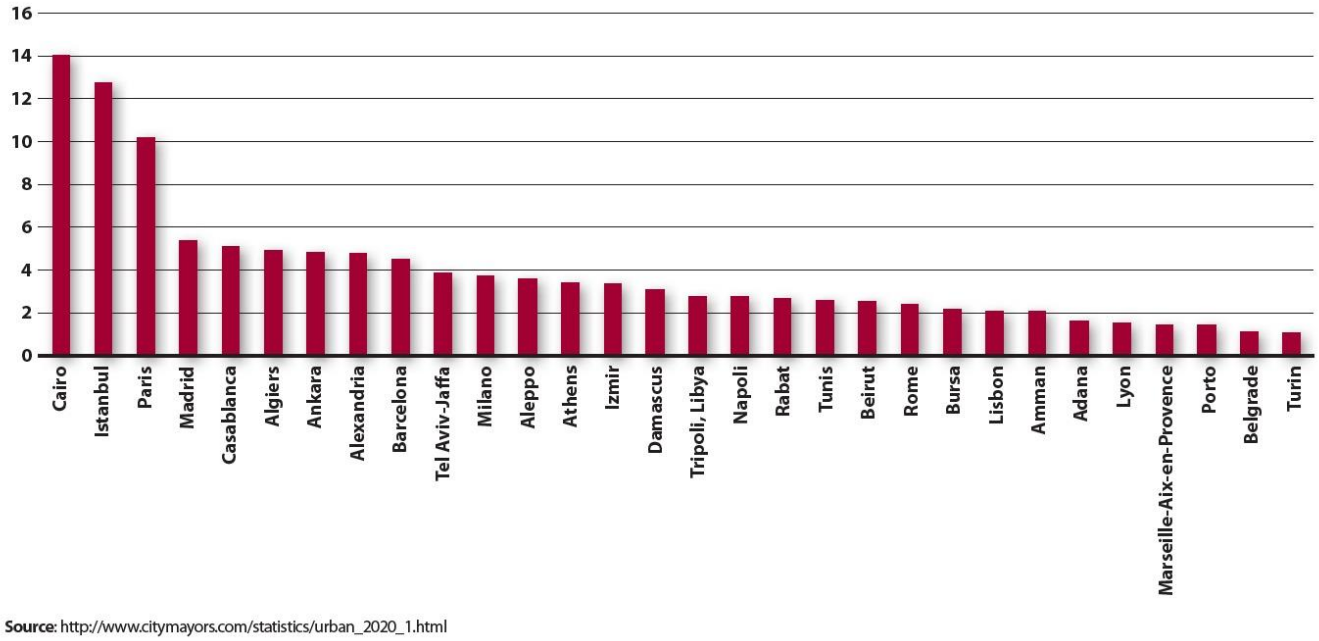


Figure 3: The Largest Urban Areas in the Countries of the Mediterranean Zone (2020 in millions)

ii) Mediterranean Cities:

Cities on the southern and northern shores of the Mediterranean belong to the oldest in the world and can consider one of the rich traditions of architecture, urban development, and municipal administration. There are fundamental differences between these cities. Mega cities like Istanbul and Cairo grapple with other challenges than medium sized cities along the Côte d'Azur that have higher per capita incomes and better infrastructure. Cities in the north of the Mediterranean also have stronger traditions of municipal self-governance and autonomy. In some cities of the southern Mediterranean mayors are more akin to appointed civil servants with limited fiscal space and decision-making power, while in many cities of the northern Mediterranean they are elected politicians with the freedom, funds, and mandate to formulate municipal initiatives of their own.

Some of the differences between northern and southern Mediterranean cities are embodied in architectural designs and urban morphologies. In the 19th century colonial cities with right-angled street grid patterns were added to the urban geography in the southern Mediterranean, housing new centers of administration, commerce, and education.

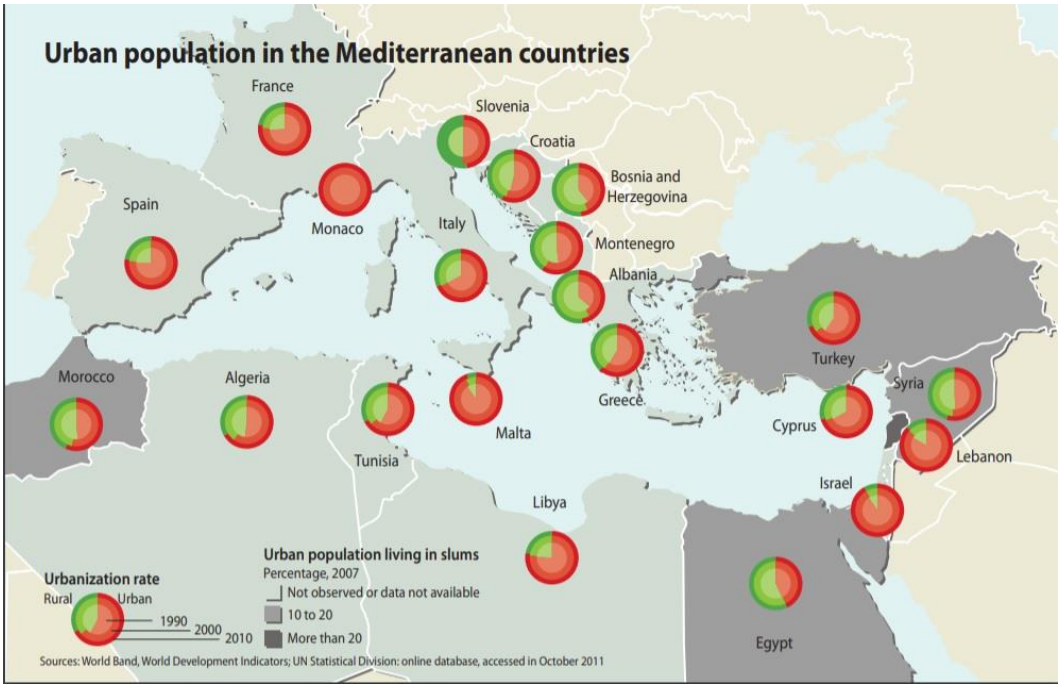


Figure 4: Urban population in the Mediterranean countries.
Source: (Population density and urban centres in the Mediterranean basin) GRID- Arendal.
https://www.grida.no/resources/5932

Pays	Total population (1000 inh)			Urbanisation rate (%)		Urban population growth rate (%)	
	1970	2000	2025	2000	2025	1970-1990	1990-1995
Spain	34 027	39 815	40 769	80,0	80,8	1,2	0,4
France	50 569	59 412	64 177	62,2	62,0	0,6	0,4
Monaco	24	34	41	100,0	100,0	1,2	1,1
Italy	53 758	57 456	53 925	71,6	72,5	0,5	-0,2
Malta	319	389	430	75,1	77,4	0,6	0,6
Slovenia	1 670	1 965	2 029	35,9	43,7	2,0	0,8
Croatia	4 406	4 473	4 193	53,0	63,4	1,8	0,6
Bosnia-Herzegovina	3 564	3 972	4 324	47,3	62,5	3,9	-0,4
Yugoslavia	8 691	10 856	12 217	53,6	64,2	2,2	0,5
Albania	2 184	3 114	3 820	35,7	49,1	3,2	3,5
Greece	8 716	10 558	10 393	59,6	64,6	1,5	0,2
North shore	**167 928**	**192 044**	**196 318**	**66,9**	**68,7**		
Turkey	35 666	65 627	87 303	66,3	76,1	4,6	3,0
Syria	6 277	15 936	24 003	58,6	72,0	4,8	3,6
Lebanon	2 177	3 206	4 147	76,8	80,1	2,6	2,6
Israel	2 935	5 851	7 861	85,2	87,3	2,4	4,8
Palestinian Authority	1 134	3 150	6 072	53,4	58,8	1,9	9,1
Cyprus	615	785	900	63,8	77,7	2,8	1,8
Egypt	32 364	66 007	94 895	64,4	83,0	3,2	2,6
Libya	1 986	6 038	8 832	73,7	77,0	6,7	4,3
Tunisia	5 127	9 615	12 892	58,3	68,5	4,3	3,2
Algeria	13 623	30 332	42 329	50,5	61,1	4,4	3,3
Morocco	15 081	28 505	38 174	52,8	65,6	4,0	3,9
South shore	**116 985**	**235 052**	**327 408**	**61,9**	**74,4**		
WHOLE	**284 913**	**427 096**	**523 726**	**64,1**	**72,2**	**2,1**	**1,7**

Sources: United Nations (*World Population Prospects. The 1998 Revision*), I.Attané & Y.Courbage (*Demographic projections of the Mediterranean countries*, 2000), *Géopolis* 1998, Plan Bleu (2001).

Table 1: Demographic changes of urban population in the Mediterranean countries 1970-1995, 2000-2025
Source: (World Population Prospects, 2011)

It is facing demographic pressure and rapid urbanization: while the region is currently 60% urbanized, it will experience a projected 45% increase of its urban population by 2030.

Concentrating populations and resources, cities in the Mediterranean have represented powerful engines of growth. Yet the urbanization process has also contributed to concentrating and exacerbating socio-economic inequalities within growing urban territories, between larger and smaller cities, and between cities and their suburban.

The Arab crisis shows us the demands for sustainable and good quality urban services for all, especially from populations living in areas with poorer amenities.

iii) Transport equipment statistics:

Analyzing chart and graphics of transport sector:

In 2018, more than half of cars were petrol in the majority of EU Member States

In 11 out of 23 EU Member States for which 2018 data are available, more than 50 % of cars were petrol. Cyprus reported the highest percentage of petrol cars (81.7 %), followed by Finland (73.7 %) and Denmark (68.3 %). Diesel-driven cars exceeded the 50 % threshold in Lithuania (67.7 %), France (65.8 %), Latvia (59.1 %), Luxembourg (58.9 %), Spain and Portugal (both 56.1 %), Austria (55.8 %), Ireland (55.5 %), Belgium (54.7 %) and Croatia (50.7 %) (see figure 5). Alternative fuels made a significant contribution in Poland (15.9 %), Italy (8.6 %), Lithuania (8.2 %) and Latvia (7.3 %). The large share of alternative energy cars in Turkey can be explained by new liquefied petroleum gases (LPG) car registrations together with cars converted from gasoline/diesel to LPG cars. (Eurostat 2020)

Basic country characteristics relevant for urban passenger mobility

	Population density (inhabitants per km²) (2017)	Percentage of households in an urban zone (DEGURBA (1) definition)	Number of passenger cars per 1 000 inhabitants (2017)	Gross Domestic Product per inhabitant (EUR) (2018)	Population aged 15 to 84 (2018)	Total population (2018)
Germany	234	90	561	40 340	69 355 118	82 792 351
Greece (2)	82	72	487	17 210	8 844 715	10 741 165
Croatia (2)	74	59	389	12 620	3 425 496	4 105 493
Latvia	31	57	356	15 130	1 582 917	1 934 379
Netherlands (2)	501	91	487	44 920	14 047 801	17 181 084
Austria	107	60	555	43 640	7 324 412	8 822 267
Poland	124	64	593	12 920	31 421 935	37 976 687
Portugal (2)	113	73	492	19 830	8 569 593	10 291 027
Romania (2)(3)	84	58	261	10 510	16 104 161	19 530 631
Slovenia	103	55	541	22 080	1 705 808	2 066 880

(1) The degree of urbanisation (DEGURBA) creates a classification of all LAU2s (Local Administrative Units - Level 2/municipalities). Urban zones are: cities (densely populated areas) (Code 1), towns and suburbs (intermediate density areas) (Code 2).
Source: https://ec.europa.eu/eurostat/ramon/miscellaneous/index.cfm?TargetUrl=DSP_DEGURBA
(2) Gross Domestic Product per inhabitant (EUR): provisional data
(3) Number of passenger cars per 1 000 inhabitants: 2015 instead of 2017

Source: Eurostat (online data codes: demo_r_d3dens; demo_pjangroup; nama_10_pc and road_eqs_carhab)

eurostat

Table 2: Basic country characteristics relevant for urban passenger mobility
Source: Eurostat (demo_r_d3dens), (demo_pjangroup), (nama_10_pc) and (road_eqs_carhab)

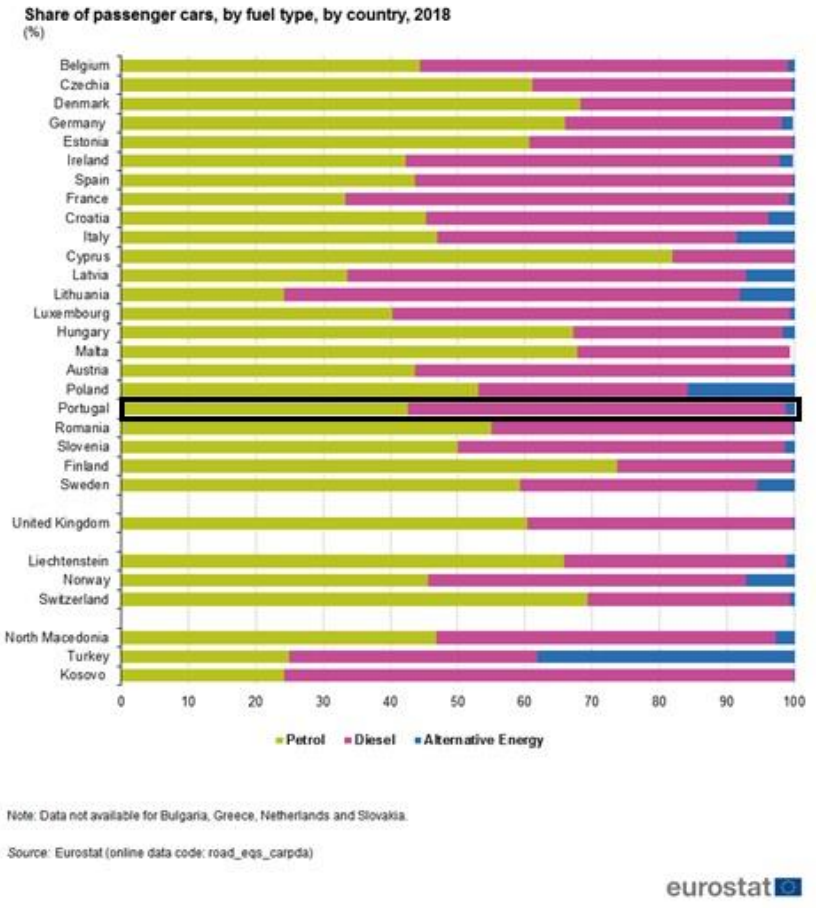


Figure 5: Share of passenger cars, by fuel type, by country, 2018 (%)

Source: Eurostat (road eqs carpda)

The motorization rate - number of passenger cars relative to population size, 2008 and 2018 (number per 1000 inhabitants) Even though they were not randomly selected, the ten EU Member States for which mobility data are available to all EU countries:

- They cover a diverse area, from Portugal in the south-west of Europe to Latvia and Poland in the north-east;
- In terms of population (aged 15 to 84), the values range from 1.6 million in Latvia to 69 million in Germany;
- The population density ranges from 31 inhabitants per km² in Latvia to 501 inhabitants per km² in the Netherlands. Five out of the 10 Member States feature between 80 and 120 inhabitants per km². In most countries, 55 % to 73 % of households are located in urban zones, except for Germany and the Netherlands where the share reaches 90 %;

- The GDP per inhabitant ranges from Eur 10 000 in Romania to Eur 45 000 in the Netherlands;
- Linked to the income level and the population density, car ownership (expressed as number of cars per 1 000 inhabitants) ranges from 261 in Romania to just over 590 in Poland. With more than 90 % of the population living in urban areas, the Netherlands shows 487 cars per 1 000 inhabitants. The Netherlands, the most densely populated country in this group, shows a high amount of bicycle use, supporting the fact that our travel habits are influenced by a combination of factors. (Motorization rate , 2008-2018)

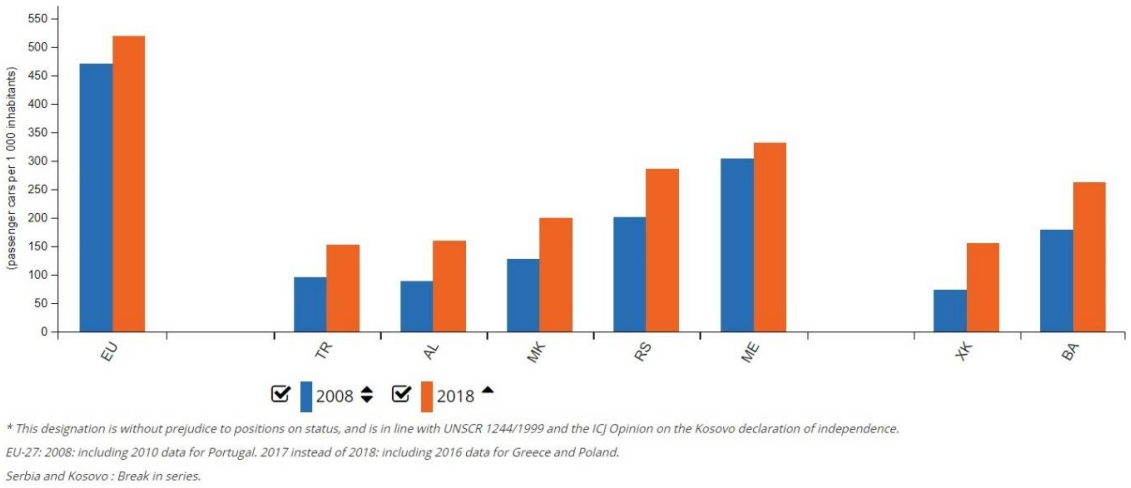


Figure 6: Motorization rate ,2008 and 2018
Source: https://ec.europa.eu/eurostat/statistics-explained/index.php/Main_Page

In figure 6 provides information on a range of transport statistics for the European Union (EU) enlargement countries, in other words the candidate countries and potential candidates. Montenegro, North Macedonia, Albania, Serbia and Turkey currently have candidate status, while Bosnia and Herzegovina and Kosovo are potential candidates.

It provides information in relation to a range of transport statistics, including the length and density of transport networks, the motorization rate and an analysis of freight transport.

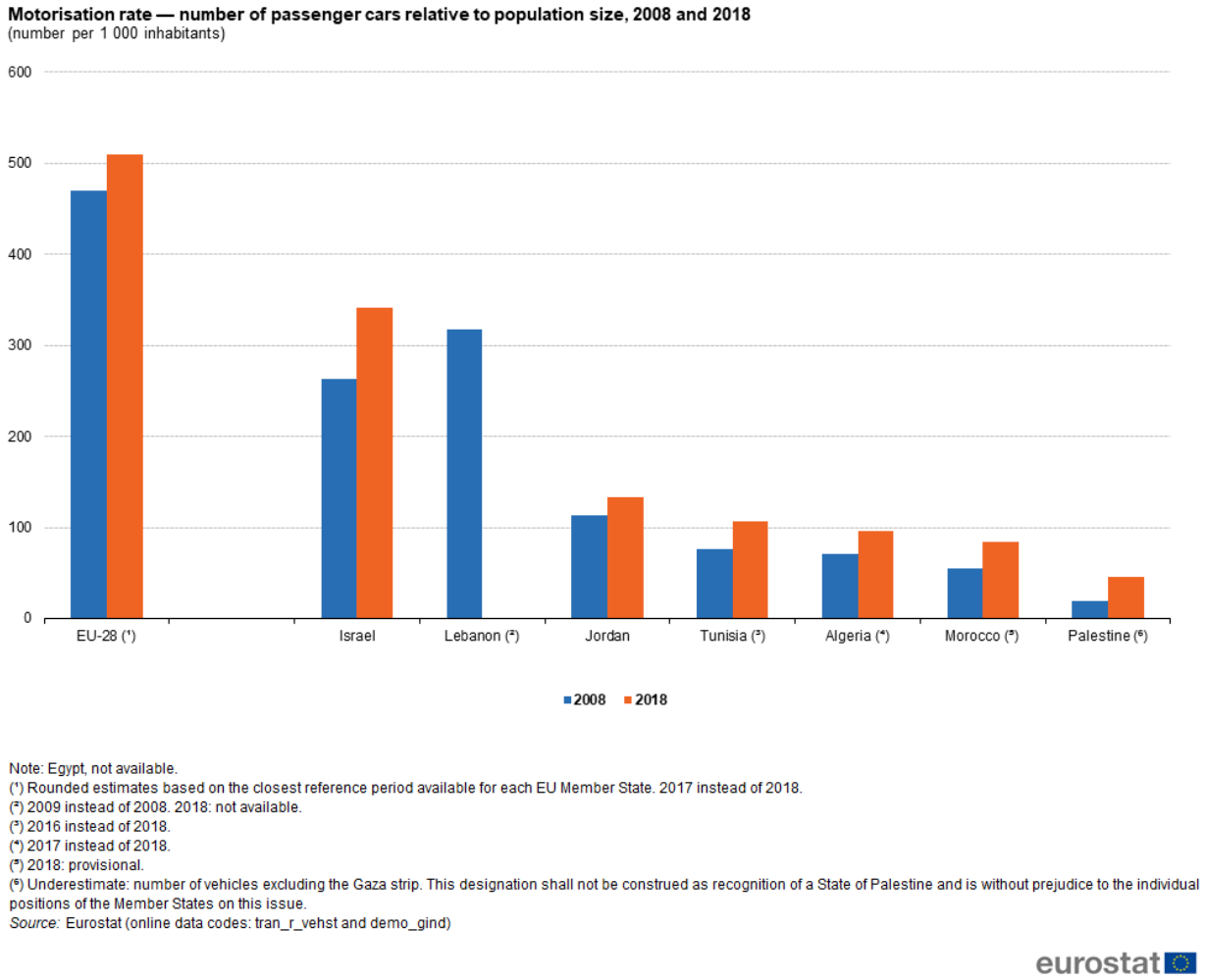


Figure 7: Motorization rate Eu with Arab countries ,2008 and 2018
Source: https://ec.europa.eu/eurostat/statistics-explained/index.php/Main_Page

This figure 7 presents information on a range of transport statistics for the European Union (EU) and 7 of the 10 countries that form the European Neighborhood Policy-South (ENP-South) region — Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, Palestine and Tunisia; no recent data available for Libya or Syria. It presents information covering transport infrastructure as well as passenger and freight transport for four different modes of transport: road, rail, air and maritime.

In figure 8 shows that the car ownership also is depending on income, the high income the high percentage of car ownership, rural areas are affected by demographic economic change, business, workplaces, and universities are usually located in urban large cities, leading rural in-habitants (in particular, young adults) to make a fundamental choice to accommodate in these cities rather than rural areas, eventually making elderly people the main part of the rural population, this leads to a poor public transport offer, due to

lower population density than expected, with the consequence that these areas become even more isolated, since the demand is not high enough and the service can be underused, consequently generating unsustainable costs, so they obligate to use private car for mobility.

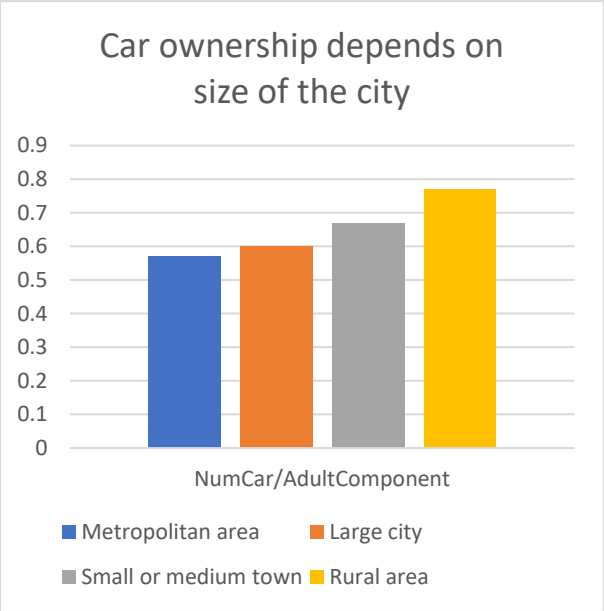


Figure 9: Car ownership depends on size of the city in EU
Source:https://ec.europa.eu/eurostat/data/database

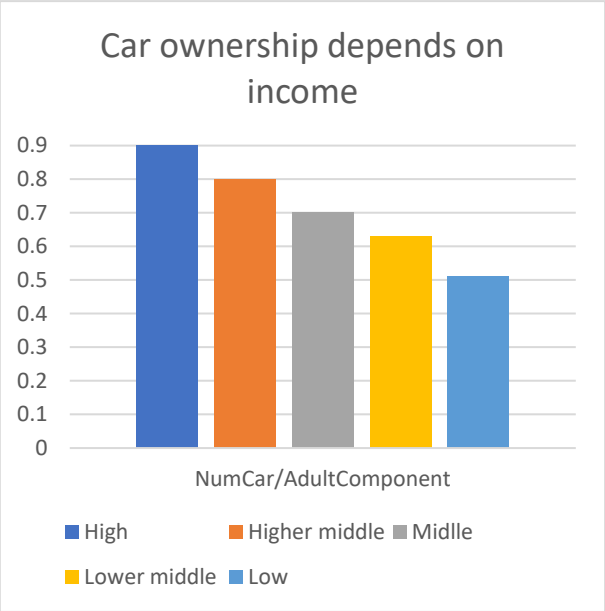


Figure 8: Car ownership depends on income in EU
Source:https://ec.europa.eu/eurostat/data/database

As for car ownership, elderly persons travel far less than younger people, as do those not in full time employment. Males travel much further than female. For other categories, those living in rural areas make somewhat fewer trips, but travel much further, than those living in urban areas. Complete account is given in Nash et al. (1995).

Nearby rural areas around urban areas are much more car-focused and car-dependent as it is shown in Figure 9. These rural areas are likely a major source of (the problem of) urban car users when shopping or going to work. How to enable rural areas to join and benefit from the urban mobility transition?

Nowadays, urban dwellers can take advantage of diverse public transport and sharing services and, at the same time, slow mobility (walking and cycling) is gaining increasing attention. As driving skills deteriorate with age, the elder will inevitably modify their long-term mobility patterns relying more and more on PT.

The extension of built-up areas is having a mechanical effect of increasing mobility flows and increasing the distances covered. This leads us to another environmental concern because this new mobility is

essentially by private cars, which, despite the progress accomplished by manufacturers, are considerably, contributing to the pollution of the air and the atmosphere. Among the other negative consequences of urban sprawl, in addition to the loss of activity in city centers, emphasis should be placed on the time budgets of peri-urban dwellers, and even more so, on the share of their income devoted to traveling which, depending on the social category, and according to estimations in France, can amount to between 10 and 30%, in figure 10 shows the relation in Germany, it is the same in Syria, shows that public transport does not need to become an inferior service when relatively high income is achieved. The demand for public transport can hence vary for the same level of income depending on the quality of service offered.

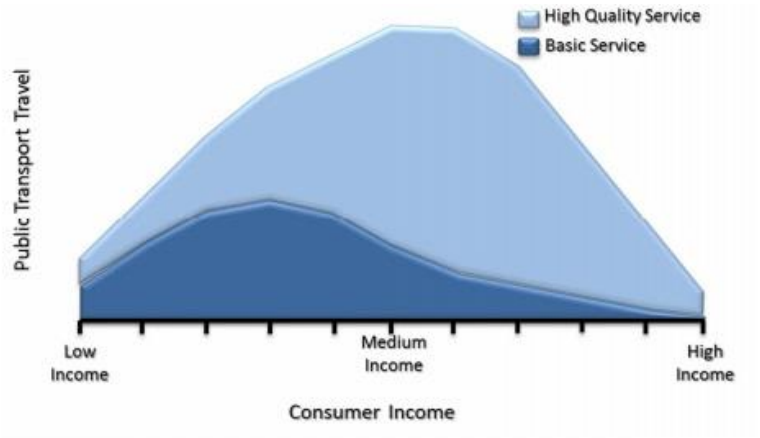


Figure 10: Public Transport demand by income in Germany
Source: APTA 2007, 2012 (Litman, 2020)

Largest daily distance due to work

Commuting is the main reason for the daily distance covered: between 27 % in Germany and 50 % in Croatia of the daily distance travelled is for work. In most cases, this is the distance between home and the place of work and back. “Leisure” or “Personal business” is generally the second purpose in terms of distance, followed by “Shopping”

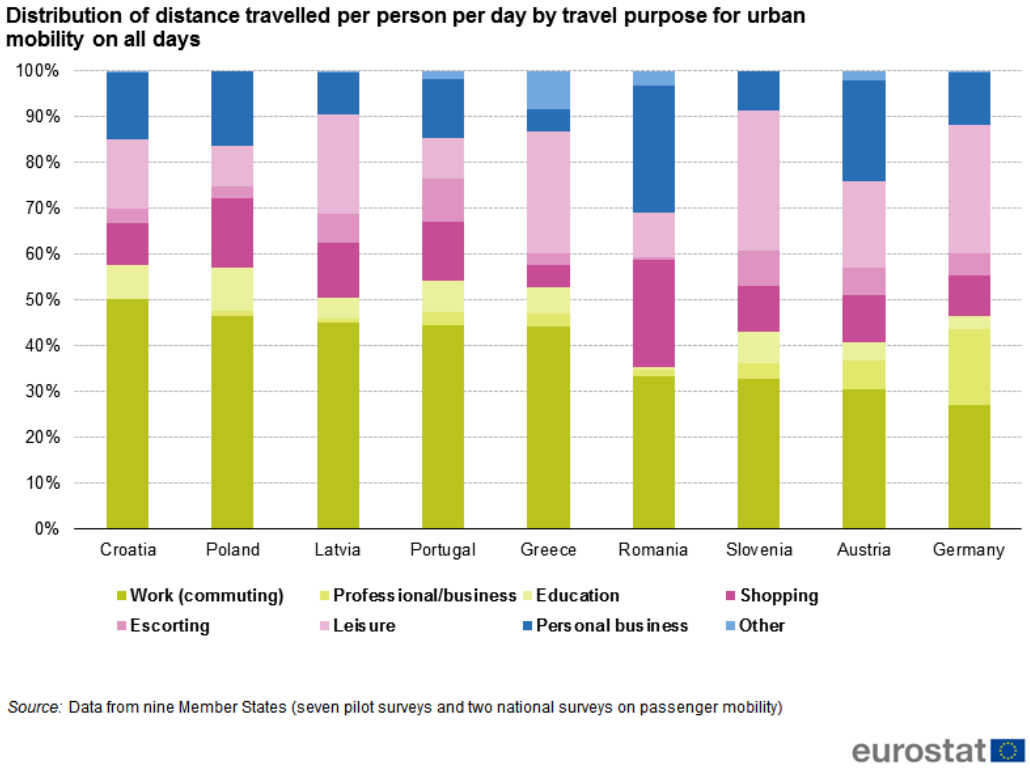


Figure 11: Distribution of distance travelled per person per day by travel purpose for urban mobility on all days
Source: Data from nine Member States (seven pilot surveys and two national surveys on passenger mobility)

In this chart in figure 11, it shows that the life courses transitions, and their impact on mobility, and what happens when the daily pattern changes for various reasons. It has been pointed out that in the event of changes in the everyday structure, people reconsider their possibilities (al & Verhoeven, 2005). Therefore, transitions or key events in life are of central importance for transport planning and decisions that influence people's choices.

As shown in the diagram, work is the first and main engine for any movement, whether travel or not, and as it was shown in previous sections that many change their place of residence from the countryside to the city in order to work and this causes many demographic and economic problems and therefore this problem must be solved in a way It makes the use of transportation in a sustainable manner, especially since this problem is exacerbated and greater in the Arab countries

Urban mobility is defined as “Trips made by residents of an urban area, where both origin and destination are inside the same urban area “. All trips made within a Functional Urban Area (FUA) by the entire population living inside and outside a city should therefore be considered. Most surveys contain information about the location of the residence of the respondents. All trips shorter than 100 km.

Modal split of passenger transport is defined as the percentage share of each mode of transport in total inland transport, expressed in passenger-kilometers (pkm). It is based on transport by passenger cars, buses and coaches, and trains. All data should be based on trips on national territory, regardless of the nationality of the vehicle. (Eurostat 2020)

The number of urban trips (trips of less than 100 km within the same urban area) represent a substantial proportion of daily short-distance mobility (less than 300 km): from 41 % in Slovenia to about two thirds in Germany, 85 % in Portugal (influenced by the fact that only the two metropolitan areas, Lisbon and Porto, were surveyed) and almost all the total short-distance trips in Romania. In terms of distance, urban trips (of less than 100 km), represent around a quarter of the total distance carried out for short-distance trips made in Slovenia (24 %), while this value reaches 88 % in Romania. (Eurostat 2020)

Urban mobility in total short-distance mobility
(%)

	Urban trips in total number of short-distance trips, %	Distance covered in urban trips in the total distance of short-distance trips, %
Germany	67.6	52.9
Greece	46.0	35.8
Croatia	47.8	36.2
Latvia	63.1	44.0
Netherlands	59.7	28.7
Austria	49.8	30.1
Poland	:	:
Portugal	84.9	65.8
Romania	99.3	88.4
Slovenia	40.8	24.0

Note: (:) not available.
Short-distance trips: less than 300 km
Urban trips: less than 100 km within the same urban area

eurostat

Source: Data from nine Member States (seven pilot surveys and two national surve

Table 3: Urban mobility in total short-distance mobility, (%)
Source: Data from nine Member States (seven pilot surveys and two national surveys on passenger mobility)

Daily urban trips: longest distances in Germany and shortest in Greece as shown in Figure 12.

Travel behavior in terms of daily distance covered differs greatly: on an average day (working or non-working day) individual cover only 5.6 km in Greece and 6.3 in Croatia, but 19 km in Germany and 18 km in Portugal.

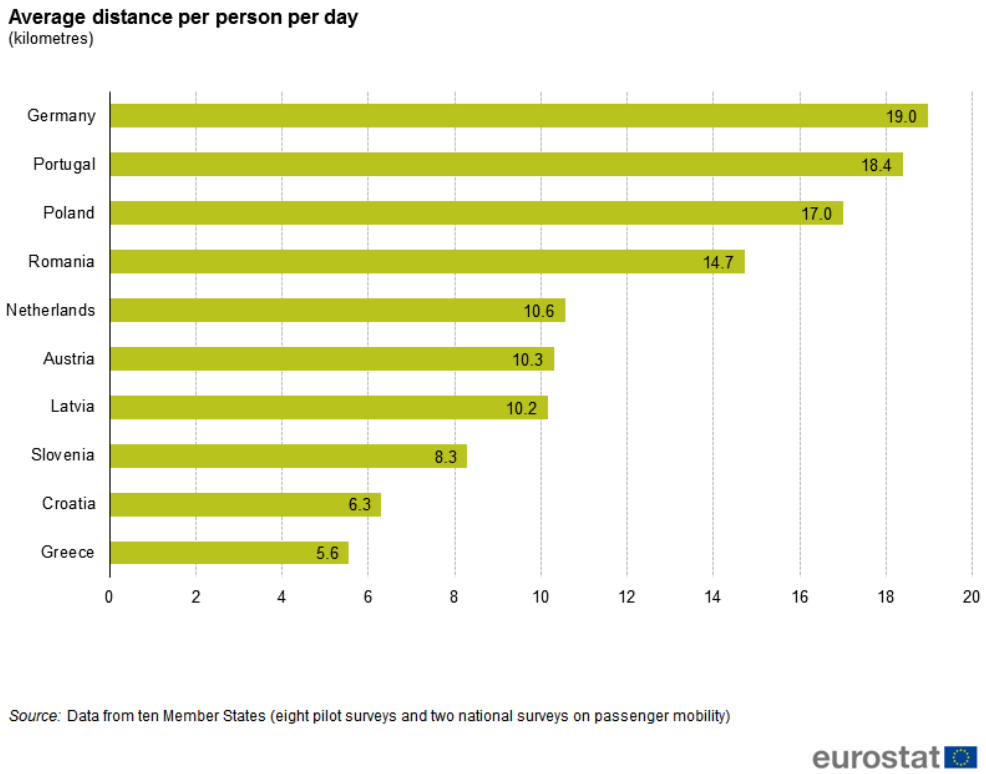


Figure 12: Average distance per person per day (kilometres)
Source: Data from ten Member States (eight pilot surveys and two national surveys on passenger mobility)

Mobility represents a key economic driver as moving people is a pre-requisite for several activities and is therefore at the core of a well-functioning and prosperous society. Raising the efficiency and quality of a country's mobility infrastructure strengthens the economy and increases the standard of living for its citizens.

This table 4 shows the relation between income and the most effective modes in Lisbon

Number and percentage of residents as a function of effective accessibility and considering the most effective mode for each census tract.

	Effective accessibility (EA)					
Most effective mode	Low Income EA Residents in census tracts		Average Income EA Residents in census tracts		High Income EA Residents in census tracts	
Walking	3215	0.11%	1354	0.05%	874	0.03%
Bicycle	2,344,893	83.10%	156,434	5.54%	7130	0.25%
Pedelec	0	0.00%	1,449,746	51.38%	286,242	10.14%
Public Transport	473,768	16.79%	287,604	10.19%	158,094	5.60%
Car	0	0.00%	926,738	32.84%	2,369,536	83.97%

Table 4: Number and percentage of residents as a function of effective accessibility and considering the most effective mode for each census tract in Lisbon
Source: (Vale, 2020)

Distribution of the population by tier of average monthly expenditure of the household with public transport, according to the condition at work (AML)

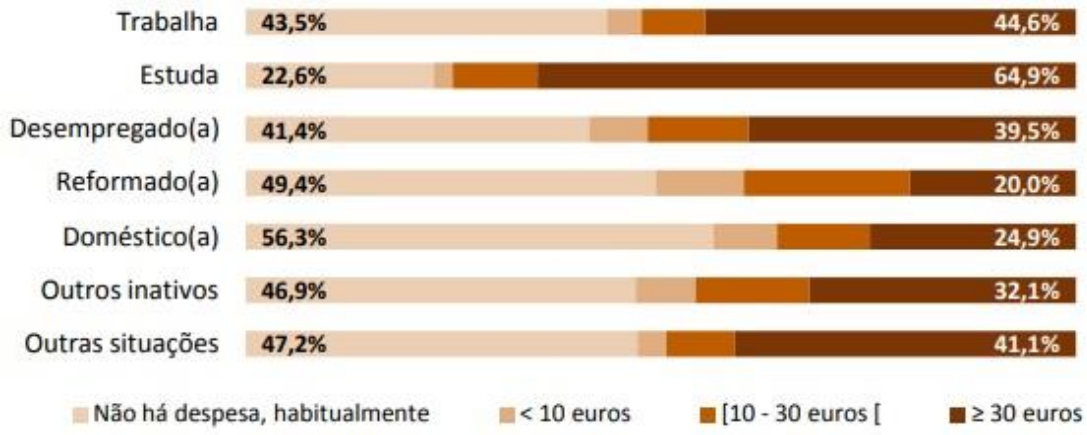


Figure 13: Distribution of the population by tier of average monthly expenditure of the household with public transport, according to the condition at work (AML)

Source: (Lima, 2017)

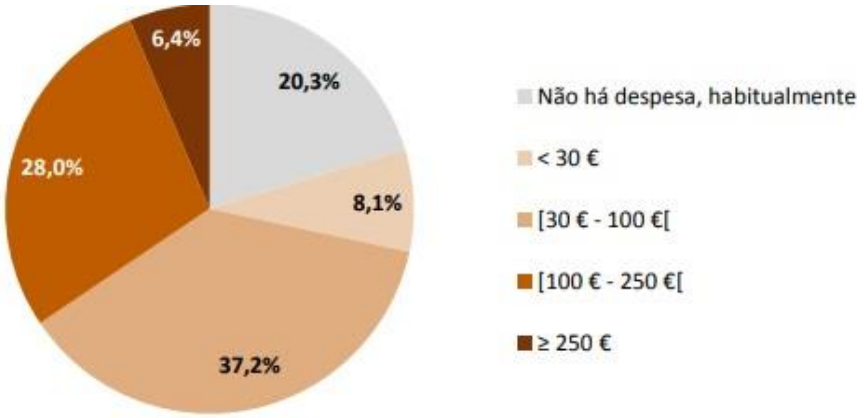


Figure 14: Distribution of the population by tier of average monthly expenditure of the household with fuel (AML)

Source: (Lima, 2017)

With regard to regular fuel expenses, among the population with vehicles available, there was a great differentiation between municipalities. There were several cases in which more than 20% of the population concerned revealed that they did not have regular expenses of this nature, such as Lisbon (30.1%). In others, the dependence on the car was evident, given the low expression of households without regular fuel costs.

In this table 5 I present the SWOT analyzes of transport in Portugal to have a general idea about transportation. (European Commission, 2006)

Strengths	Weaknesses
• Excellent geographical location by the Atlantic Ocean; growth potential for the maritime infrastructure. • Well developed road/motorway network • Much experience with EU financing of infrastructure projects	• Peripheral geographical location within the European Union • Differences between the Portuguese and European railway gauge and signalling standards • Traffic problems in urban areas aggravated by an excessive dependence on individual automobile transport and rapid urban population expansion • High road accidents rate partly caused by poor infrastructure design and maintenance • Lack of an integrated logistics, transport and intermodality vision • Low share of railways in passenger movements
Opportunities	**Threats**
• Available EU support for the overall modernization and upgrading of the Portuguese transport infrastructure • Conditions for the improvement of the main urban transportation systems, and most especially its intermodal connections, as well as the implementations of more advanced and environmentally friendly means of transportation and related technologies	• Decreasing role of railway transport • Declining role of public transport, in particular in urban areas • Poor economic performance causing lack of national resources, both public and private, for transport-related investment; depleted local budgets will mean public investment in the near future will be at a modest pace

Table 5: Transport system SWOT analyzes for Portugal
Source: European Commission, DG-REGIO

In this table 6, I notice the high rate of CO^2 emission from transport sector as the most of Arab countries, except UAE, Qatar and Bahrain, which have a very developed transport sector, and they have a successful sustainable transport experiences, that makes the emissions less than the other Arab countries.

Country	CO_2 emissions from the combustion of all types of fuel [106 tons]	CO_2 emissions from the transport sector [106 tons]	% CO_2 emissions from transport sector
Algeria	98.6	33.3	34
Egypt	177.6	38.4	22
Libya	51.6	12.1	23
Morocco	46.0	10.6	23
Sudan	13.7	6.8	50
Tunisia	21.9	6.0	27
Bahrain	23.6	3.6	15
Iraq	104.5	29.7	28
Jordan	18.6	5.2	28
Kuwait	87.4	11.7	13
Lebanon	18.6	5.0	27
Oman	40.3	6.3	16
Qatar	64.9	9.2	14
KSA	446.0	104.4	23
Syria	57.8	12.2	21
UAE	154.0	25.7	17
Yemen	21.7	6.2	29
Total	1446.8	326.4	23 (avg)

Table 6: CO2 Emissions from Fossil Fuel Consumption in the Arab World in 2010 (Bedrous, 2013)
Source: UNESCO

After the review of Share of passenger cars, by fuel type, by EU countries and the CO^2 emission in the Arab world; it is concluded that the transport sector as a whole contributes with a high percentage of CO2 emissions, European cities have high-quality Public transport, and are usually more committed to promoting sustainability and low-carbon solutions, particularly if compared to other cities around the world. Nevertheless, pollution, especially carbon dioxide emissions, can still be extensively reduced. With this respect, restrictions on traffic and parking in downtown areas have been already implemented in several European cities, or via speed limitations, which significantly reduce the currently high levels of carbon dioxide emission, it is recommended that Syria develop transport policies and strategies in the view to improve the energy efficiency of its transport sector: Modal shift, Energy efficiency improvement of the existing vehicles, Fleet renewal – i.e., replacement of old vehicles by new ones more efficient, Improve the way the vehicles are used.

In Arab countries, the use of old and inefficient cars is contributing to high fuel consumption and high GHG emissions. As shown in Table 7, many countries set some import regulations as well as inspection programs (Green Economy in a Blue World, 2008).

Country	Import regulations	Inspection program
Jordan	Banned the import of cars older than five years	Roadworthiness inspection
Algeria	Banned the import of vehicles older than three years	Roadworthiness inspection
Egypt	Banned the import of vehicles older than three years. The imported vehicles must have a catalytic converter	- Vehicle inspection - Emission testing - I/M for public buses.
Kuwait	Banned the import of vehicles older than five years	Cars older than three years must have an annual Roadworthiness inspection.
Lebanon	Banned the import of vehicles older than eight years	-Roadworthiness inspection for vehicles older than two years. - Annual exemption for petrol vehicles. - I/M for diesel vehicles every six months
Morocco		Vehicle emission inspection
Qatar	Banned the import of vehicles older than five years	Regular Roadworthiness inspection
Saudi Arabia	Banned the import of vehicles manufactured before 1974 Prohibited the import of vehicles and light trucks more than five years old. Banned the import of reassembled, remanufactured and previously used motor parts. [23]	Roadworthiness inspection
Syria	Banned the import of vehicles older than two years	Vehicle testing program
Tunisia	Banned the import of vehicles older than three years	Vehicle emission testing program
UAE		Vehicle inspection program
Yemen	Banned the import of vehicles older than five years	

Table 7: Adopted Vehicles Import and Inspection Programs
Source: (Green Economy in a Blue World, 2008)

There has been significant growth in the number of private vehicles in the Arab world, with an estimated annual increase of 4.2% between 1997 and 2008, compared to the 2.8% estimated for developing countries (ESCWA, 2009).

Despite efforts mentioned in the above sections that aim at encouraging sustainable modes of transport, there are still many challenges that hinder the implementation of sustainable transport policies.

I can see that all countries are willing for sustainable transport system by its ability.

Domestic energy-pricing policies affect directly the introduction and growth of green transport modes or sustainable modes. The current highly inefficient use of heavily subsidized liquid-petroleum products in the transport sector of Arab countries especially in Syria presents a major barrier to the use of cleaner

transport fuel. As long as the domestic prices of more polluting liquid petroleum fuels are heavily subsidized and not constrained by strict environmental regulations to use cleaner fuels, consumers will continue to use liquid fuels in a highly inefficient way. This distorting fuel-pricing policy is not only environmentally detrimental to these countries' economies, given that "energy efficiency measures are among the most cost-effective means of reducing a country's carbon but also a major financial burden on the countries' treasuries.

With the exception of Jordan, Mauritania, Morocco and Palestine, the average prices for petroleum-fuel products in the Arab region are way below the global average as is evident.

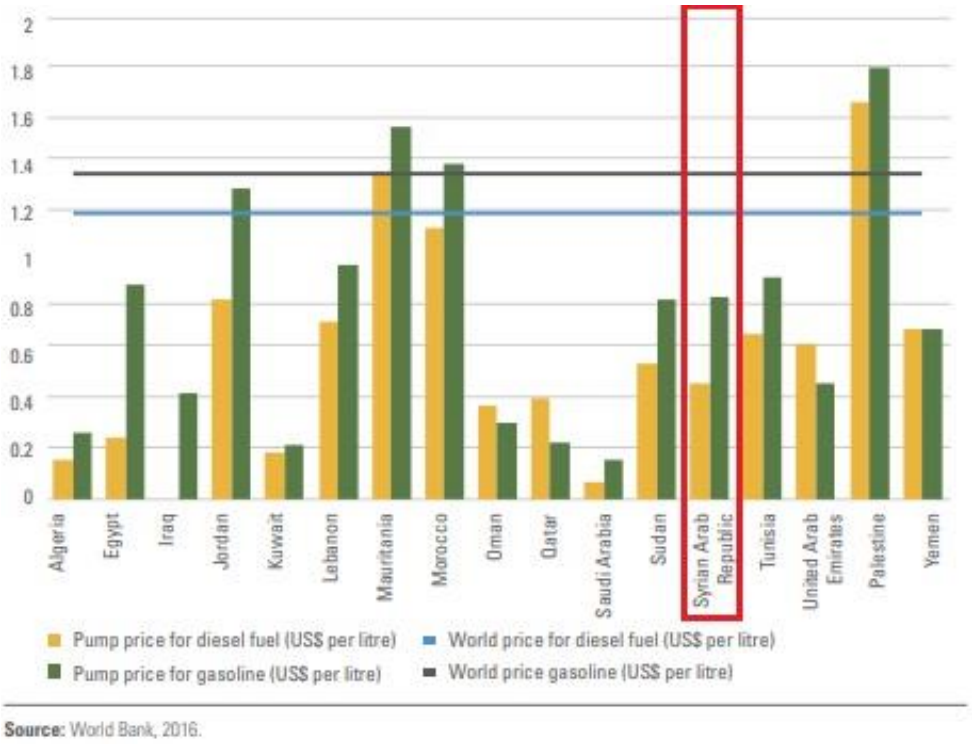


Figure 15: Fuel-pump prices in the Arab region, 2014
Source: World bank (World Development Report, 2016)

The changing from diesel to another green product in transport requires more than just an assessment of the prices of fuels, which at present are mainly gasoline and diesel in the case of Arab countries. The factors that need to be considered for the introduction of sustainable transport modes include a number of direct and other costs. The key direct costs that an individual user (private vehicles) or public transport

(taxis, buses, etc.) would face are: Conversion costs, Level of taxation of electric transport as a transport fuel compared to gasoline.

In these Arab countries, except United Arab Emirates, there is no local conversion industry in the Arab region, moreover, most of them don't have good transport infrastructure.

The impact of tourism on transport planning:

The Mediterranean countries are the most famous tourist destinations. Portugal registered the fourth largest increase of over tourism according to Eurostat data (8%). Experts however highlight the dangers of that. Tourism in Portugal recorded 71.3 million tourists during 2017.

Tourism contributes CO2 emissions, mostly through increased use of air and road transportation. Beyond that, the major direct pressure from coastal tourism on the marine and coastal environment is the demand for space, both in the coastal zone, resulting mainly in urbanization, and on the coastline itself, through construction of marinas and other infrastructure that leads to concretization of the shores. The concentration of tourism within specific geographical areas and limited time periods increases pressure on natural resources such as fresh water and leads to higher rates of sewage and solid waste production. Coastal tourism is, by definition, located in sensitive habitats within the coastal zone, such as beaches, sand dunes, and wetlands. The unavoidable result is change in the state of these habitats and their associated ecosystems, as well as economic impacts on other activities that benefit from coastal ecosystem services. Unsustainable development of mass tourism will result in the rapid degradation of fragile natural habitats (EEA and UNEP 1999, UNEP/MAP/MED POL 2005). (GRID-Arendal, 2013)

While the numbers of visitors continue to grow in Portugal, some critics point out that there are many harmful effects. Ana Velosa, director of the Heritage Rehabilitation course and associate professor with aggregation at the University of Aveiro, states that tourism can be very important for the promotion of urban rehabilitation.

"The tourist pressure has generated, in some cities of the country, poorly thought actions of urban rehabilitation, without paying the necessary attention to the existing assets. Quick and poorly sustained actions may have results in the short term but in the medium or long term will have the opposite effect in terms of tourist attraction, either losing the originality of the buildings or prompting their early degradation," she foresees.

For Jorge Gonçalves, professor of the Department of Civil Engineering, Architecture and Georesources of Instituto Superior Técnico, it is obvious that tourism has played its share or even boosted urban rehabilitation in significant parts of the national territory.

“Decisive contributions to urban renewal are expected to take place, like the one that is about to happen in Colina de Santana, in Lisbon,” he recalls, before projecting the future. “Now the intention is to make sure that the places which benefit from these transformations do not die of the cure that forgets key values, such as the promotion of the city as an advocate of social and functional diversity,” he warns. (Brain, 2018)

There are several environmental impacts in the tourist city of Syria (Homs, Damascus and Latakia), there is traffic congestion, noise, lack of urban management, insufficient mass transport and in some cases, there is no public transport in service, illegal expansion of hospitality enterprises, and reduction of environmental quality.

In the other side, in Lisbon, the common impacts are the traffic congestion and negative environmental impact, but there are a very good, easy and cheap public transport services for the important sightseeing places, I feel that when I came to Lisbon, making trips with my family, that make sense to take the advantages of some application that are suitable to Syria.

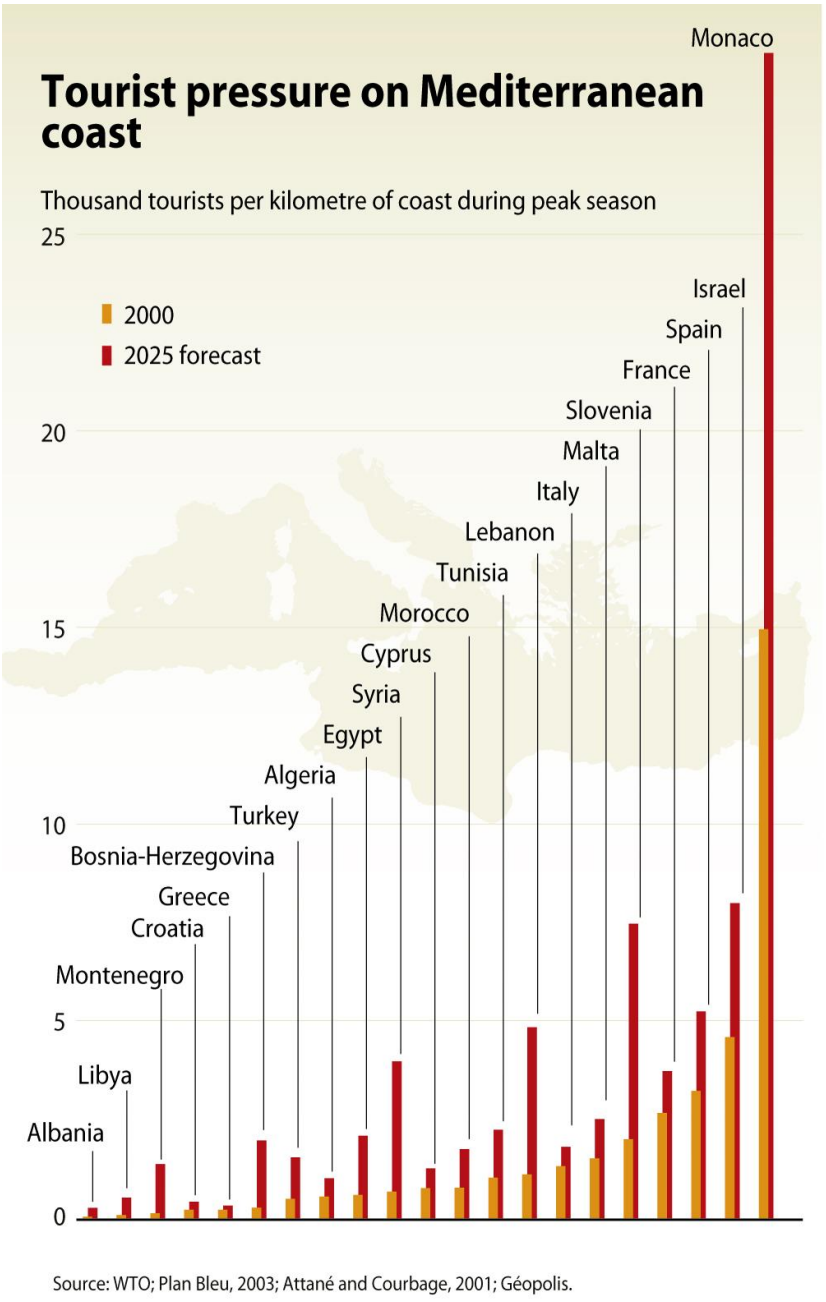


Figure 16:Tourist pressure on Mediterranean coast
Source : (GRID-Arendal, 2013).https://www.grida.no/resources/5922

transport is a key element in the tourism industry, it is important to understand sustainable tourism, by itself, does not necessarily imply fewer negative impacts or more positive impacts in absolute terms.

The demand in international and even local transport infrastructures implies a large number of people to be transported in an efficient, fast and inexpensive manner.

After analyzing these tables and charts, it is concluded that there are four elements that strongly affect daily travel behavior: private and professional career; the adaption of long-term mobility decisions (such as car ownership and residential location); exogenous interventions; and other long-term processes that are not regarded as key events (e.g., age group, adolescent phase etc.). An overview of academic work on mobility biographies and related approaches can be found in (Schoenduwe, Mueller, Peters, & Lanzendorf, 2015), it is more detailed in figure 17.

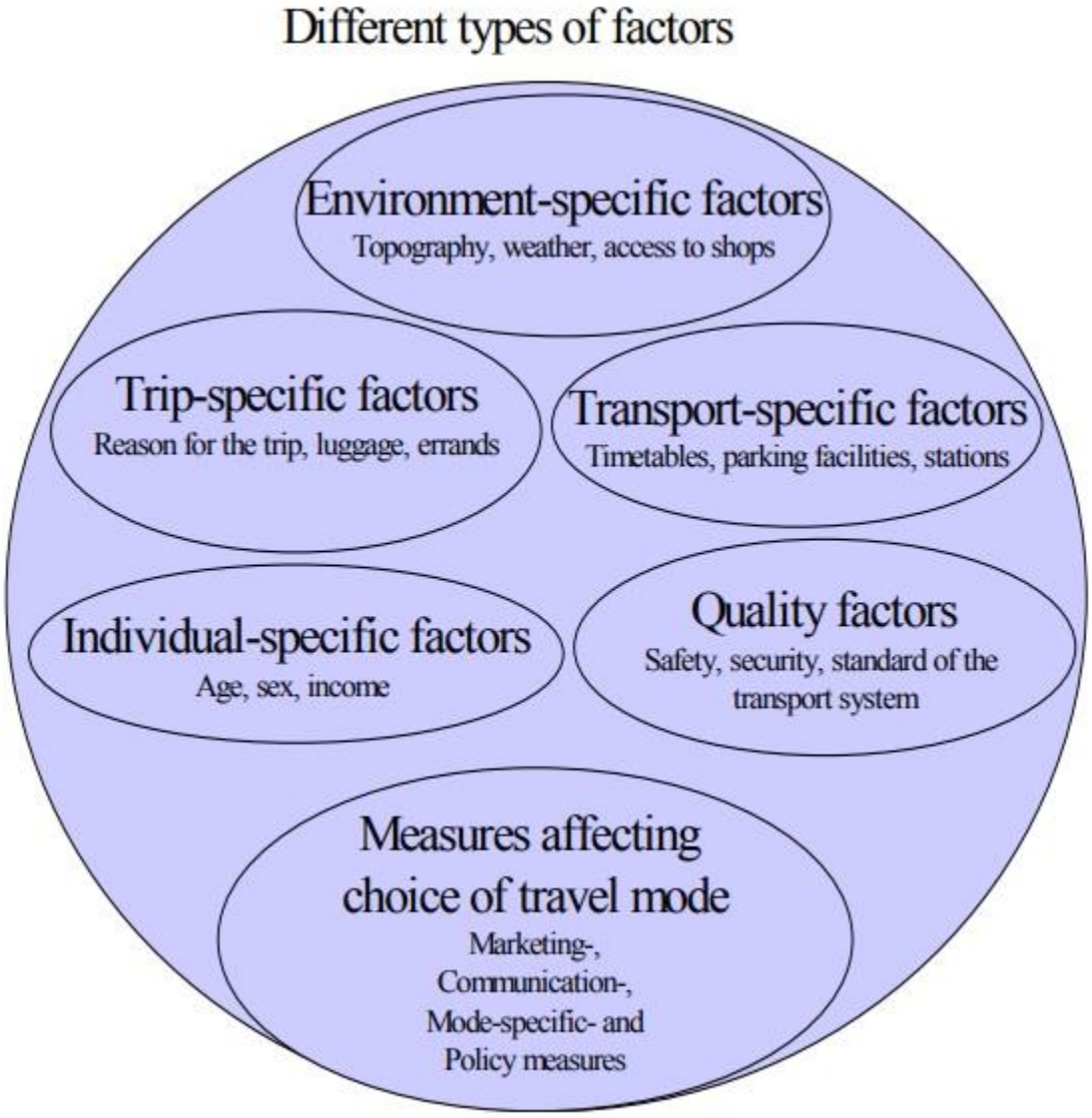


Figure 17: Factors to choose transport modes
Source: (Steckelberg, Barretto, & Morales, 2017)

Example of measures that can be taken to influence car drivers to travel less by car are information/education, economic incentives or sanctions, influencing social norms, making car journeys

less attractive, reducing the need to travel by changing the locations of homes, workplaces, shops, and leisure centers, or by making alternative means of travel more attractive. The different measures have varying effectiveness, costs, time horizons and political feasibility (Olsson, 2003).

3.3. Characteristics, performances and operational constrains of urban modes of transport

Statistical information is very important to analyze the transportation system. Data analytics and data sharing among stakeholders and organizations have the potential to increase the efficiency of mobility by identifying better environment, transit routes, transport services and infrastructure improvements. The European Commission Directorate-General for Mobility and Transport (DG MOVE) has set various goals in its White Paper (Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system. There is, therefore, a need for data that measures our daily trips and allows for better planning and monitoring of EU policies. (system, 2016)

A study by Beirão and Sarsfield Cabral (2007) (Beirão & Sarsfield Cabral, 2007) examined different areas in the metropolitan region of Porto, Portugal. It is a qualitative study where interviews were conducted about respondents' attitude towards public transport and the car. What obstacles are there for car users to change means of transport?

The problem is the traffic jams and finding a parking space. On the other hand, if a trip is to be made within the metropolitan region or during rush hour traffic, the car is seen as a good choice rather than public transport, due to the long waiting times and uncertainty arriving time of the bus, it is seen as unreliable.

4. IDENTIFYING THE MAIN PROBLEMS REGARDING TO URBAN MOBILITY IN MID-SIZE METROPOLITAN AREAS

Many challenges are faced by the urban mobility all over the world. Particularly in the Arab Mediterranean world, to face the demand associated to the rapid urban population growth, transport experts point out that new policies and a stricter control of car use must be developed to guarantee a more efficient public transport response to the increase of the number of trips and reduce energy consumption, therefore the governments of these countries must formulate an effective policy to improve the future.

Metropolitan growth in Lisbon during the most of the twentieth century occurred without the adequate provision of transportation infrastructure. Limited financial and technical resources, along with a highly conservative political situation, limited the capacity to respond to the rapid and countrywide migrations towards the country's largest cities. Housing shortages opened the path to private-led piecemeal and leapfrog development patterns, based on low levels of infrastructure and urban facilities (André and Vale 2012; Santos 2012; 2013). The majority of Syria's cities are facing the same situation, in addition the bad condition after the war, maybe this point I can consider it the same period after the earthquake in Lisbon 1755.

The aim is better design will have better lives. This thesis is based on a series of papers prepared for an OECD Global Forum on Transport and Environment in a Globalizing World in the context of sustainability.

4.1. Identifying the main problems and possible strategies

All vital cities are faced with expanding urbanization, combined with rapid urban population. These trends lead to increased mobility demands and a strong need for transport infrastructure.

Southern Mediterranean countries are also included in this phenomenon and must also confront difficulties from the multiplication of poorly regulated informal or small-scale systems and from the decline, of public or private transport companies.

Confronting with these problems and the increasing use of automobiles, governments and local authorities in charge of urban transport are aware of the need to develop their urban transport networks, but progresses are often lacking because authorities do not always consider people as a priority in planning, they are putting the prioritization to car selling and road infrastructures, instead of investment in public transport, it is certainly an important reason. The other one is associated to safety, as medium classes are afraid to use public transport or don't feel comfortable with them because they are not in good shape, are old and uncomfortable and mainly used by lower classes, with whom middle classes don't want to mix. In recent industrial or tertiary economies are also a question of social status.

The problems of transport sector in Arab countries are a large legacy, as several governments have failed to find radical solutions. The situation became more complicated in countries such as Tunisia, Egypt, Syria, and others, due to the Arab crisis in 2011.

All people demand better conditions for its workers or better working conditions and renewal of the fleet, especially when the urbanization is expected to rise from 64% in 2004 to almost 75% in 2025 so by 2025, the urban population in the region will have increased by approximately 80 million.

The congestion of road networks, with long waiting queues and economic losses estimated at up to 5% of the GNP in the OECD countries is continuing to increase in step with the increase of vehicle owners and the standardized use of private vehicles. This situation appears to be critical in all the major eastern cities like Istanbul or Athens, where a shortage of high-performance community transport services means that most traveling takes place in private cars or collective taxis. However, this situation is often encountered in the North of the Mediterranean urban countries.

4.2.1. The direct transport problems:

The recent trend of transportation, represented by the increased use of a diversity of means of transport:

1) as a result of economic policies promoting car industry and the improvement of family revenues = more cars purchase and in circulation;

2) as a consequence, more environmental and social impacts – air pollution, noise, space consumption and traffic victims/accidents – and traffic congestion and economic losses associated.

The problems of transport activity are numerous, due to the amplitude of its activity, it is intertwined with all human, economic, social, political and military activities, local, national and international, and it can be identified as follows:

1. Problems of direct modes of transportation, which are related to the operation and use of each mode such as cars, trains, and airplanes, for example energy consumption, emissions of Green House Gases, congestion and noise.
2. Indirect problems associated with public transportation such as the oil spill from giant oil tankers and external traffic to cities.
3. Transport problems in its spatial relationships with the population and their economic activities such as agriculture, industry and trade, and their social activities such as easy access to educational and health services centers, shopping, and others.

The improved transport connection can help in tackling social exclusion through addressing these barriers:

Affordability refers to the extent to which the financial cost of journeys puts an individual or household in the position of having to make sacrifices to travel, or to the extent to which they can afford to travel when they want to.
Availability of transport is used to refer to route possibilities, timings and frequency.
Accessibility describes the ease with which all categories of passenger can use public transport. For example, buses with high steps are difficult to board, particularly if they are one-person operated and there is no assistance. Accessibility also includes ease of finding out about travel possibilities, i.e. the information function.
Acceptability is another important quality of public transport, either because of the transport or the standards of the traveller. For example, travellers may be deterred from using public transport due to lack of personal security on buses and trains.
Source: Carruthers et al, 2005.

Source: (Planning and design for sustainable urban mobility, 2013)

So, we can categorize the challenges of urban transport:

Challenges	Dimensions
Environmental challenges	Mitigate environmental externalities (emissions, noise). Reverse logistic flows (waste and recycling).
Economic challenges	Capacity of urban freight transport systems (congestion). Lower driving speeds and frequent disruptions (reliability). Distribution sprawl (space consumption). E-commerce (home deliveries).
Social and institutional challenges	Health and safety (accidents, hazardous materials). Passenger/freight interferences (conflicts). Access (allowable vehicles, streets and delivery hours). Zoning (land use, logistics zones, urban freight distribution centres).

Table 8: Challenges of urban transport (Environmental, economic, social and institutional)
Source: (Planning and design for sustainable urban mobility, 2013)

So, we can categorize them:

- First: Ease of access:

The large numbers of cars, with the deterioration of the condition of streets inside cities and roads outside in terms of their capacity and traffic flow, led to negative results represented in the deterioration of the level of accessibility of individuals to their destinations, the essential reason of deterioration due to traffic congestion, this also leads to pollution due to increased fuel consumption.

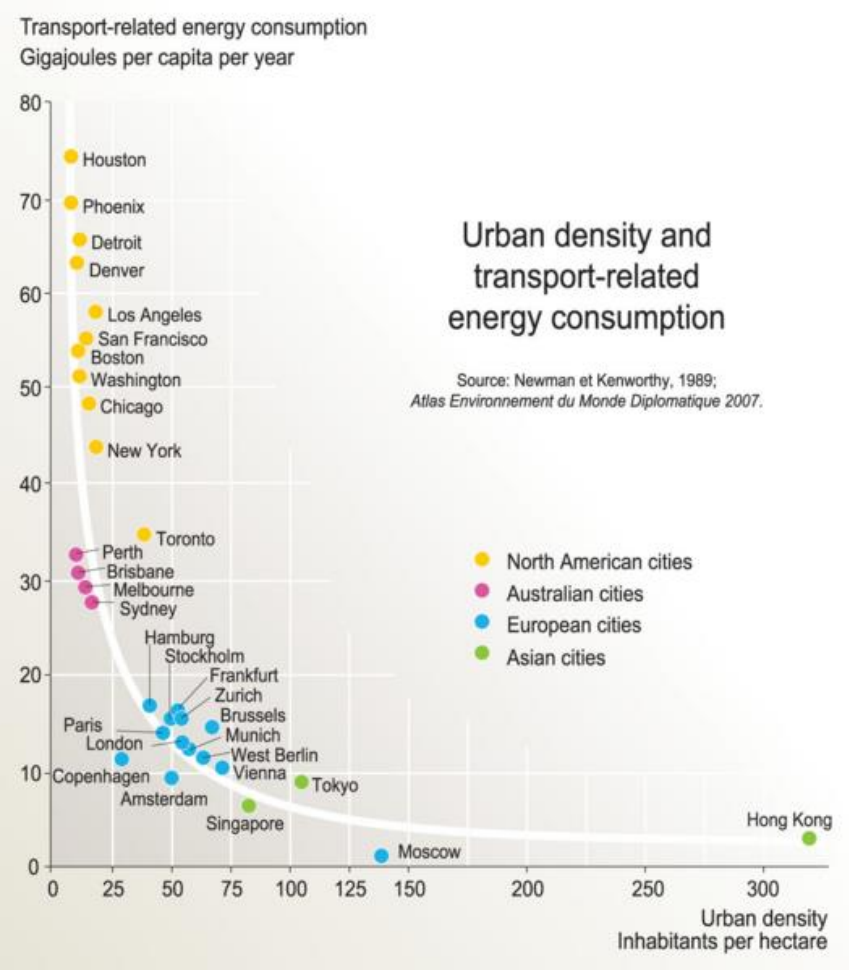


Figure 18:Transport related energy consumption /gigajoules per capita per year
Source: (GRID-Arendal, 2013)Urban density and transport-related energy consumption
https://www.grida.no/resources/5414

- Second: Traffic congestion, traffic jams and accidents:

Work's trips, shopping, visiting, or entertainment are concentrated at certain hours of the day or on specific days of the week, therefore traffic congestion occurs in rush hours, especially cars and public transport, in 1970 this lead to develop the public transport systems, public transport has expanded significantly, including subways, buses, trains, and metro, especially at the entrances of the metropolitan capital cities such as London, Moscow, Cairo, Baghdad and Riyadh.

The increasing of private car ownership makes more problems of congestion and traffic because the number of these cars, which requires more spaces for facilities at the expense of other land uses. In a scientific study of land uses in several Arabic cities, the percentage of the street networks and car parks is 28.4 % of the total areas of these cities, and these ratios are also found in the cities of European countries.

Transportation facilities in some of these cities occupy 40% of their area, but in developing countries I find that this percentage is less than 20% and descends to less than 15% in slums and old neighborhoods. Traffic and congestion confuse planners and the responsible of transport sector, as it is with drivers and residents, it consumed energy, time and effort, and requires huge funds to build bridges, road construction and tunnels.

Congestion leads to accidents, whether transport modes or people, which causes enormous human and physical damage, also it impedes movement and accessibility, which means wasting time, in addition the increasing cost of traffic modes due to the fuel uses.

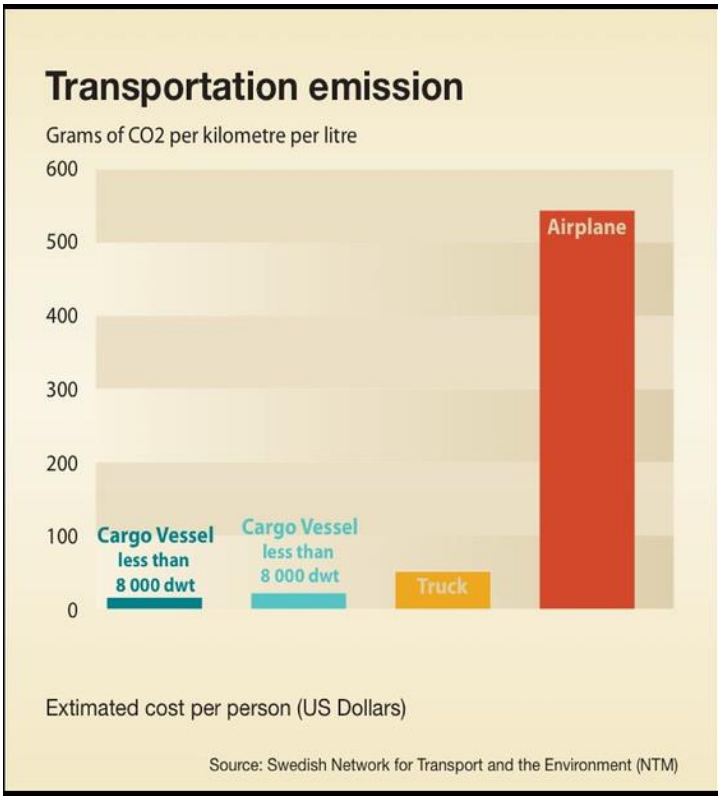


Figure 19: Transport emission
Source : (GRID-Arendal, 2013) Transportation emission
https://www.grida.no/resources/7447

Figure 20 In pink, the average German rates used here. Better results can be obtained for metro, tram and train if more people are using them (better network and schedules, accessibility, affordability and competitiveness compared to cars).

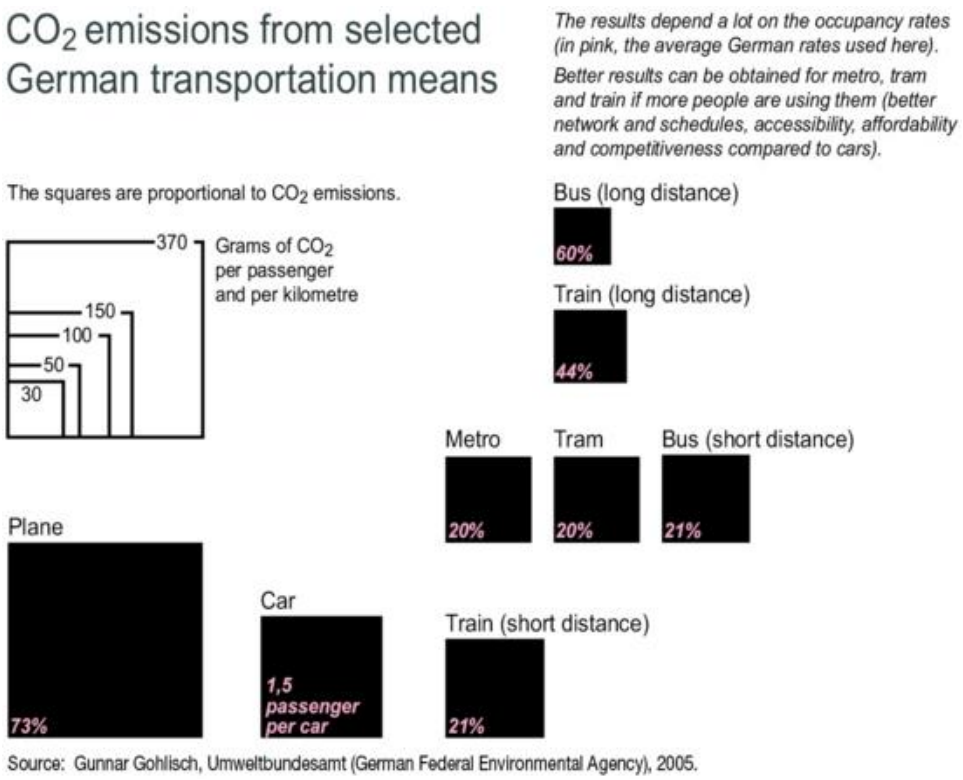


Figure 20: Co² emission from selected German transportation means
Source: (GRID-Arendal, 2013) German transportation means
https://www.grida.no/resources/5394

Result:

In the past few decades there has been an increased attention for evaluate the environmental effects of transport and developing mechanisms to report their evolution. The transport sector is the primary driver of the growth in total energy consumption, which is likewise directly linked with total emissions despite the important efforts devoted to environmental abatement policies, the high rate of increase in transport demand is exceeding the rate of improvement in environmental technology for transport.

- Third: Road safety and accidents:

Road safety is related to the traffic of cars, trains, and pedestrians, through city streets, roads cities linking (regional roads) and railways, where traffic interferes with different uses of the land, and this leads to a breach the functions of these modes in terms of (operational efficiency and ensuring an acceptable level of road safety), due to the following reasons:

1- Unorganized use of the land along the street and road, which leads cars to park along the street, or at the same place of stop, this is due to accidents.

2- Slum urban and economic growth represented by the spread of urban residential, industrial, economic, agricultural, and commercial compounds, legal and illegal along roads within cities, as well as along regional road,

The causes of slum expansion are:

- The lack of urban and regional planning processes that meet the spaces needed to accommodate the development of urban and economic activities.
- Weakness of the transport integration of street and road networks, and the low efficiency of the road linking (local, regional, and international), this has led to the great concentration of various activities at the main road tracks, in developing and less developed countries.
- There are poor geographical, geometric, and economic studies to plan an optimum distribution of land uses.

- Fourth: Accidents of other modes of transportation:

Train's collision, or derailment, like two train accidents in northeastern Spain that killed more than a hundred people, and an eastern Canadian train transporting oil product that killed eighty people, and both in July 2013.

4.2.2. The indirect transport problems:

Currently there is considerable concern with limiting the growth of transport demand, the use of resources and related pollution,

The responsible for over 25 per cent of world primary energy use and 22 per cent of CO_2 emission from fossil fuel use (Stopher & Stanley, 2014) on the car, public transport and freight sector, it is the essential contributing factor to the increased greenhouse effect and global warming especially the high level in the atmosphere leads the retention of heat by the earth then raise average temperatures by up to 2° in 2025.

The great level of CO_2 emission is from car per passenger higher 11-63 per cent than public transport,

the other problem is how to achieve stabilization object on a global level, the developed countries must make a substantial cut in their levels of emissions so the developing countries can improve their situations.

In the urban areas, in specific combination (Nitrogen Oxide emissions with other air pollutants) can lead to respiratory difficulties and reduce lung function.

One of the problems that has a big role in the growth in traffic, particularly by car, is the absence of appropriate Strategic Environmental Assessment (SEA)methods, it is difficult to apply comprehensive SEA ,the assessment , the identification or mitigation of environmental effects of polices , plans or programs as appraisal methods differ ,decision making structure differ and financing structure differ, but the successful SEA application is limited a few isolated cases Europe due to the limited use of public participation to create awareness and public acceptability.

The increase of transport volume brings more noise and air pollution especially if it is on existing infrastructure, while new one involves property demolition and visual intrusion.

The official forecast of road traffic growth suggest that traffic will roughly double by the year 2025 (Road Traffic Forecasts, Moving Britain Ahead, 2018). These forecasts are very crude; without considering the demographic change.

4.2.3. Solutions:

There are ways to decrease some of these negative effects without influencing the rate of traffic growth, there are no technological solutions. The only way to reduce Co_2 is to use less fuel or switch to renewable energy sources and increase active travel (walking and cycling) and public transport usage seeking to significant improvements in public health, but also is important to consider the reduction of the need of mobility, improving accessibility to work, shops, services and social facilities. With the pandemic of COVID19 this was very clear in our cities.

The important question is which alternative future transport policy scenarios could change the rate of road traffic growth??

In general accessibility is an important element of integrated, sustainable transport and land use planning. But what is the meaning of accessibility? There are different definitions. The first comes from Hansen (Hansen, 1959), which sees it as “the potential of opportunities for interaction”. Handy and Niemeier (Handy, 1997) expand on the definition, noting that this potential is “determined by the spatial distribution of potential destinations, the ease of reaching each destination, and the magnitude, quality, and character of the activities found there”. Accessibility, therefore, reflects land use patterns that determine

the spatial distribution of activities and the transport system; these, in turn, determine the ease of reaching a destination. The combined evaluation of both the spatial distribution of activities and the transport system makes accessibility an extremely powerful tool to promote sustainable urban development and planning.

Two perspectives dominate accessibility studies: people-based and place-based (Miller, 2005). From a people-based perspective, accessibility is measured in terms of the constraints and abilities specific to an individual, such as their income, that affect their access to a particular transport mode, and their space-time anchors (Hägerstrand, 1970). The place-based perspective measures accessibility for a particular place; it ignores individual characteristics and instead takes as its starting point the possibilities that a person, who is located at a certain place at a certain time, has to interact with other relevant places. The approach is sometimes referred to as potential accessibility to emphasize the overall, general character of measures.

Kwan, M. P. (1998). Space-time and integral measures of individual accessibility: A comparative analysis using a point-based framework. Geographical Analysis, 30(3), 191–216.

The person-based approach is an extremely useful way to understand travel behavior, as the mobility pattern of a particular individual is highly influenced by his/her accessibility options (Kwan, 1998). However, these measures require significant amounts of data and can vary significantly within a certain location, as the abilities and constraints of a specific individual can significantly reduce the potential accessibility of a place. For instance, in a place with good public transport (PT) infrastructure, one individual might have high individual accessibility and another might not, simply due to the fact that the space-time anchors of the second person require them to travel to a place where PT is less accessible. Such difficulties mean that place-based accessibility is often a more useful planning tool, as it reflects land use and transport policies (Curtis, 2016).

However, the drawback of place-based measures is that they can overstate accessibility for a particular individual, or group of individuals, since the approach implicitly assumes that all individuals take equal advantage of accessibility options, which might not be the case in practice. (Vale, 2020)

These are the categorized policies that make sense of changing:

1. Infrastructure: both from the surface down and above the surface (traffic signals, communications, computers, toll gates, sensors etc.) and more fare distribution of the public

space devoted to motion among the different means of transport (pedestrian, bicycle, public transport, taxi, private car, etc.).

2. Vehicles: types of vehicles, their safety features, their degree of use of advanced electronics and computing.
3. Management: privileging the less pollutant means. Or reducing car lanes in central congested areas well served by PT and also parking facilities in such areas, that will favor PT use and walking.
4. Information: of human behavior, preferences and use of transport modes, regulation and enforcement.
5. Prices: (Road Pricing, Fuel Duty, Public transport Fares) charging drivers to use a road can help to reduce congestion, distribute the social costs of driving more fairly, and improve air quality. The price can be set to closely reflect the real cost: for example, a higher congestion charge can be imposed on heavier and more polluting vehicles.
6. Land Use: housing and transport policies have historically been developed by separate ministries. This has led to cities where residential areas are poorly connected to jobs, schools, hospitals and parks, so people end up driving long distances every day.

The effects of land-use on public transport demand

- Interspersion of activities ----trip lengths and trip frequency.
- Shape of the urban area---- trip lengths.
- Density ----trip lengths and trip frequency.
- Clustering ----of trip ends public transport.
- Settlement size ----trip lengths, public transport.

(Balcombe, Mackett, Paulley, & Paulley, 2004)

All these elements are interrelated, and the relationship between them and transport will depend on the definition of the variable used to measure each element. (Balcombe, Mackett, Paulley, & Paulley, 2004).

4.2. Critical analysis of the EU policies to urban transportation issues

First, I will mention how is the decision-making process works, how decisions are made

EU policies and laws are carefully designed to bring benefits to citizens, businesses and other stakeholders in the EU. Better regulation tools ensure that policy is based on evidence and best available practice. Depending on its level of political importance, an initiative is either agreed on by the Commission during the Commissioners' weekly meetings, using the oral procedure, or by written procedure.

Before the Commission proposes a new policy or law, it:

- Describes the initiative in a roadmap or inception impact assessment,
- Examines the potential economic, social and environmental consequences in an impact assessment,
- Requests input from the public and stakeholders, for example via public consultations.

Citizens can suggest new EU policies or laws through the European citizens' initiative. (How decisions are made, 2018)

In these compact, like Lisbon and other advanced cities, people can live, work, study, shop, and have fun without excessive travel. They also tend to produce fewer greenhouse gas emissions from transport, so the compact and advanced cities which use public transport more than the private car, they can also help to tackle climate change.

City governments have led the way in creating more advanced cities, building on success and learning from each other. In Portugal several pilot projects applied both for light-duty vehicles (Rolim, Farias, & Shiftan, 2010) or for bus fleets have proved the potential to educate the driver, reducing fuel consumption up to 20% over several months (Duarte, Gonçalves, & Farias, 2010). The issue of how long the reduction in fuel consumption prevails is of large interest, since in other contexts, (e.g., smart meters) it has been found that the prevalence of the energy reducing behavior decays over time (Ferraro 2011). (Baptista, Azevedo, & & Farias, 2012)

But city governments in Syria cannot improve urban transportation on their own. They need supportive policies at all levels of government to encourage mixed-use development, discourage private car use, boost public transport use and make it easy to walk or cycle.

The Mediterranean Action Plan (MAP) was established in 1975 as a coherent legal and institutional framework for cooperation through which all Mediterranean countries decided to jointly address common challenges of environmental degradation while linking sustainable resource management with development. It was soon followed by the Barcelona Convention and seven Protocols addressing issues relevant to the conservation and sustainable use of marine and coastal resources as well as to many policies and measures aiming to improve its management. (GRID-Arendal, 2013) (State of the Mediterranean Marine and Coastal Environment)

In general, urban big cities led to the physical expansion of cities beyond the administrative boundaries, different types of functional urban areas, metropolitan regions show their complex and multi modal urban transport systems and for typically being transport nodes of European and national importance.

Planning mobility at metropolitan scale needs specific guidance and concrete examples that can direct metropolitan regions around Europe to overcome the specific governance.

EU policies:

The OECD (2013), in collaboration with the EU, has developed a harmonized definition of urban areas which categorizes functional urban areas of different sizes beyond the administrative boundaries.

Nowadays we must achieve Sustainable Urban Mobility Planning for its impressive intermodal transport solutions with a people-friendly focus and its excellence in linking transport planning with the overall urban planning process, while considering accessibility for different social groups.

The EU-funded project PROSPECTS - Procedures for Recommending Optimal Sustainable Planning of European City Transport Systems (PROSPECTS 2000-2003)- investigated the decision-making processes for urban transport planning, and identified a decision-making process for sustainable transport planning in the European context. This process, which incorporated results from a number of previous EU research projects, was described in detail in" a Decision Makers Guidebook" (DMG). (May, 2003) The DMG was designed to help all those involved in decisions on land use of transport, in cities throughout Europe, whether they are politicians, professional advisers, stakeholders or individual citizens.

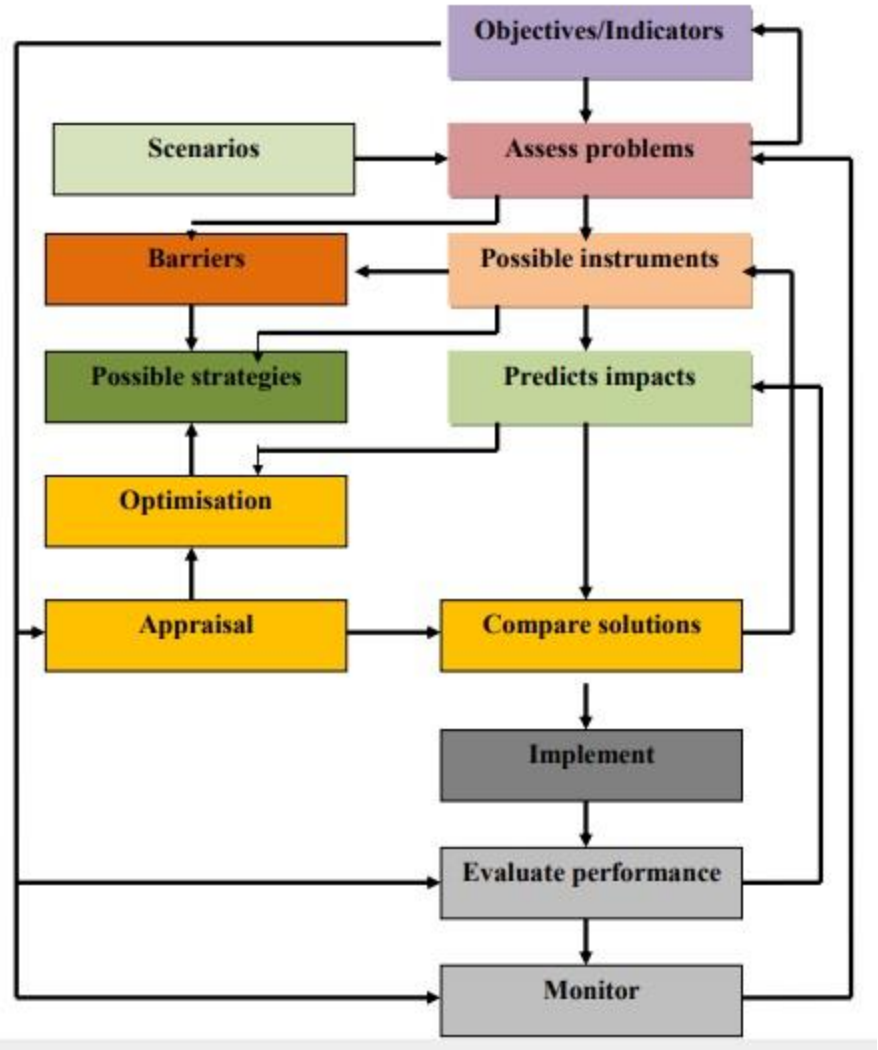


Figure 21: The" ideal" Decision Making process
Source: (Boubkr & Brahim, 2012)

European cities differ in the ways in which they make decisions, but their approaches have often developed over time, In PROSPECTS DMG over 50 Cities in Europe were asked which approach they were using, in terms of: vision-led; consensus-led or plan-led. A summary of their responses in shown in Figure 22. It can be seen that most of the cities adopt a mixed approach, particularly either a plan/consensus mix or a vision/plan mix. (Boubkr & Brahim, 2012)

A vision approach is critically dependent on the individual with the vision, a plan approach can become extremely dependent on professional planners, who may do not care as much as the needs of citizens, especially those not associated with powerful groups and who thus cannot make their voices heard. A consensus approach, sometimes if the agreement doesn't apply in a reasonable length of time, lead to unacceptable delay and inaction.

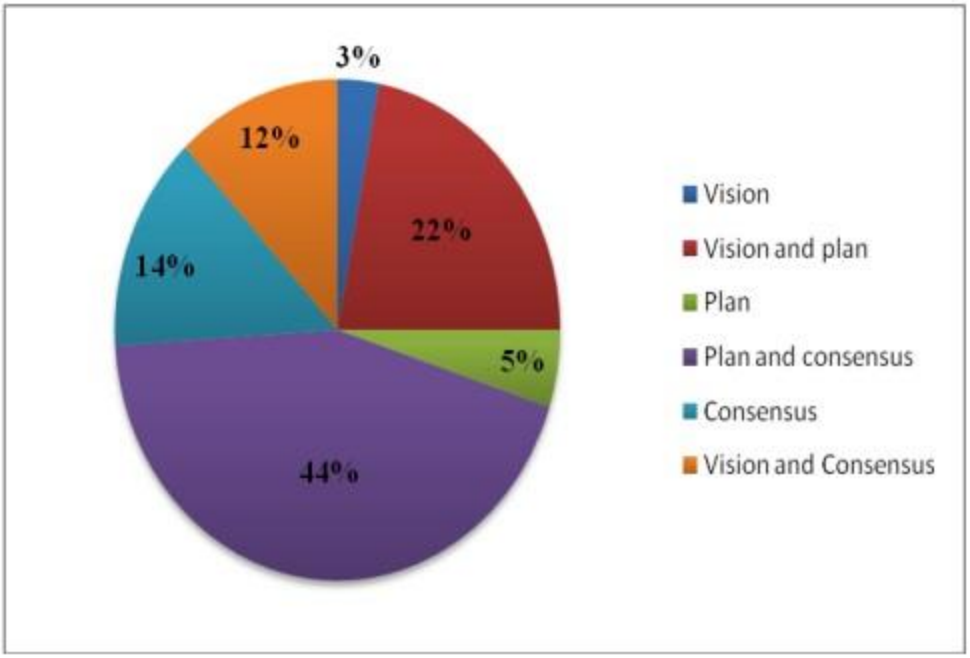


Figure 22: European cities decision making approaches
Source: (How decisions are made, 2018)

Arab policies:

- **2006:** Policy Development Meeting for MENAWA on Cleaner Fuels & Vehicles (CFV), Egypt.
- **2008:** GCC Policy Development Meeting for CFV, Bahrain.
- **2010:** Middle East CFV for Clean Air Policy Forum, Egypt:

  Objectives: Awareness & facilitation to develop Roadmap for CFV.

  Outcome: Recommendations to Council of Arab Minister Responsible for the Environment (CAMRE); *key words: Legislation; Action Plan; Fuel Specs Guidelines.*

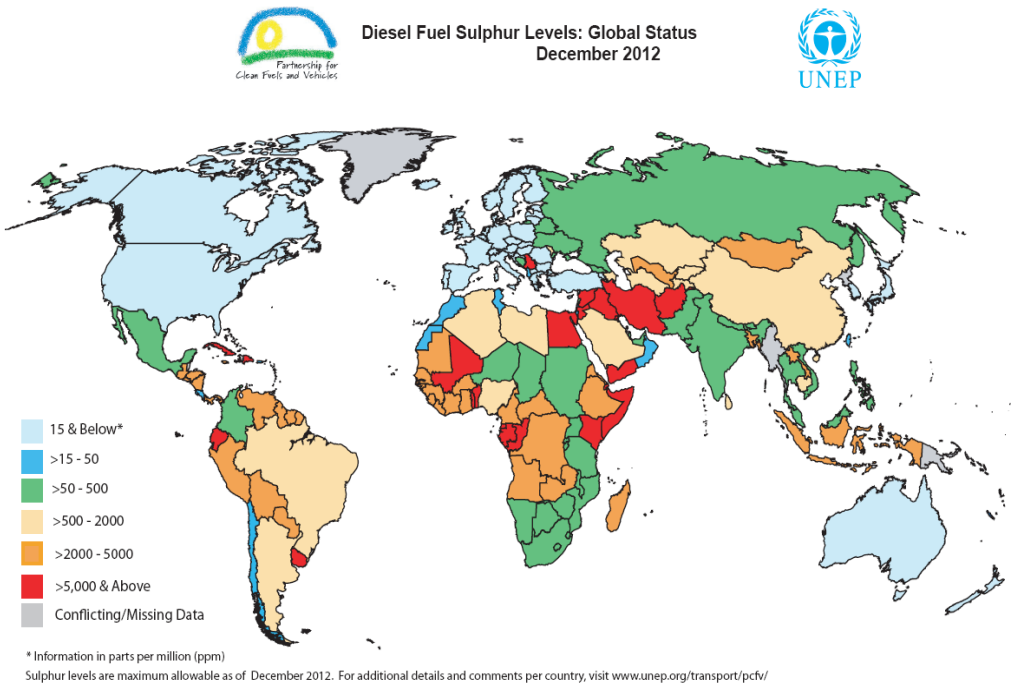


Figure 23: Global status December 2012: Diesel Fuel Sulphur Levels

Source: http://www.unep.org/transport/pcfv/meetings/CairoEgypt-meeting.asp

Currently conducting study on Cleaner Fuels and Vehicles in the Arab region.

UNEP Initiative in Transport:

- PCFV (Partnership for Clean Fuels and Vehicles)
- Global Fuel Economy Initiative (GFEI)
- Non-Motorized Transport
- Public Transport
- Sustainable UN

*Achievements mentioned in 2010 PCFV forum:

Jordan, Tunisia & Morocco gone fully unleaded

Tunisia adopted low-Sulphur standards (3,000pp & 50ppm imports) from 5,000ppm

3 of the 18 countries in the region already have 50 ppm Sulphur in diesel:

Morocco, Oman, Israel

7 countries set dates to reach 50 ppm Sulphur:

- Qatar & UAE: 2010
- Algeria, Tunisia & Kuwait: 2013
- Saudi Arabia: 2014
- Syria: 2015

4 countries have Low-Sulphur Road Maps: Kuwait, Qatar, Saudi Arabia & Syria

Remaining 9 have not set a timetable for low Sulphur

4 countries are at 500 ppm

Fuel specifications and emission performance standards: These standards regulate transport fuel specifications and motor vehicle emissions (mainly CO, NOX and HC). Such regulations have been adopted mainly in industrialized countries, focusing on: maximum emission levels and smoke standards; fuel efficiency standards; vehicle certification and testing regulations; fuel quality standards, setting limits on impurities; limitations on fuel additives; and refueling control regulations. In the Arab countries, several standards and regulations related to fuel quality have been issued during the last years, including: The Syrian Arab Republic issued eight fuel specifications for refineries in Homs and Banias and enacted decrees No. 1052 in 2004 and No. 847 in 2008 for controlling vehicle emissions as well as a decree for environment tax in 2005 regarding high emission vehicles; (United Nations Economic and Social Commission for Western Asia input to the High-Level Political Forum on Sustainable Development and the ECOSOC Annual Ministerial Review, 2014)

The Arab countries that have responded to the questionnaire on sustainable transport have identified and ranked a group of seven challenges facing their efforts and plans to achieve sustainable transport. The ranking of the different challenges has varied from one country to the other as shown in table 3 with the most important factor being ranked as “1”and as the least important one as “7”.

Countries	Barriers and their ranking						
	Limited funding	Lack of awareness and capacity-building	Inadequate institutional and regulatory frames	Inappropriate implementation mechanisms	Lack of data and information	Weak/lack of integrated policies and plans	Lack of appropriate technical expertise
Egypt	1	7	2	3	6	4	5
Jordan	1	2	7	6	5	4	3
Lebanon	3	4	5	6	2	1	7
Palestine	1	7	3	6	4	5	2
Qatar	7	3	6	4	2	5	1
The Sudan	1	5	6	2	7	3	4
Syrian Arab Republic	1	6	7	5	2	3	4
Total score	15	34	36	32	28	25	26
Ranking of the barriers	1st	6th	7th	5th	4th	2nd	3rd

Table 9: Ranking of sustainable transport barriers in some Arab countries
Source: UNESCWA

From the analysis of the questionnaire responses, it is clear that the limited funds are the main barrier in moving towards sustainable transport. Lack of information, integrated policies and technical staff form the second group of main barriers, while the remaining three (awareness and capacity-building, institutional and regulatory frames, and implementation mechanism) are the least affecting barriers.

Decision Making Process in Arab World in general:

There are two extreme approaches to decisions: a rational, analytical approach which leads to the right solution, and less organized approach, the objectives are never specified, action is taken when it becomes essential, and more important decisions are dependent on the power struggles between interest groups.

The strategy development in Homs should take place within an ongoing context of public participation, which can be classified according to the following levels: information provision; consultation; deciding together; acting together; and supporting independent stakeholder groups. A large number of various European cities have been implemented in, in general, a successful public participation strategy will combine a wide range of such methods.

Transportation, infrastructure and communication policies are key to economic growth and transition in the Western Balkans region. The transportation sector, in particular, has significant environmental implications; an efficient transportation sector would reduce the emissions of GHG and lessen impacts of air pollutions on human health. While the transportation system in South-Eastern Europe has improved in recent years, standards are still generally low, and in the region's large, rapidly growing cities, traffic is

one of the main causes of poor air quality. Among the problems contributing to inefficiencies in the transportation sector are ageing vehicles, poor vehicle maintenance, variable fuel quality, the poor condition of many roads, and frequent traffic congestion. In FYR Macedonia, BiH and Serbia, the use of leaded fuel has been reduced but not yet banned. Public transportation within and between cities is I adequate, although demand for it has grown steadily in recent years, and demand for freight transportation doubled between 2001 and 2006.

The Strategic Transport Research and Innovation Agenda (STRIA) Roadmap for Smart Mobility and Services aims to assess emerging new technologies such as multi-modal, electric and autonomous vehicles, drone technology and on-demand mobility services.

STRIA builds on and integrates seven thematic transport research areas:

- Cooperative, connected and automated transport;
- Transport electrification;
- Vehicle design and manufacturing;
- Low-emission alternative energy for transport;
- Network and traffic management systems;
- Smart mobility and services; and
- Infrastructure. (Luisa, et al., 2017)

The main objectives of transport policies are the knowledge base on Sustainable Urban Land Use and Transport

1. Economic efficiency: In public transport, it is normally defined to consider revenue and costs to transport operators and the costs and travel times of transport users.
2. Environmental protection: the impact of transport facilities, and their use, on the environment of both users and non-users, include noise, atmospheric pollution, vibration, visual intrusion, severance, fear and intimidation, and loss of valuable things.
3. Safety: This means reduction of loss of life, injuries and damage to property. Statistics indicate that public transport has safety advantages over car transport.

4. Accessibility: Improved accessibility is associated with the promotion of social inclusion. This can be defined as the ease of reaching facilities and can be contrasted with mobility which is the ease of movement. Statistics indicate that public transport has benefits over car transport.

5. Sustainability: This means that meets the needs of the present without compromising the ability of future generations to meet their own needs, it is a high-level objective.

6. Economic regeneration: as re-enforcing land-use plans of the area by promoting economic development in particular locations, transport improvements promote economies of scale in production thus leading to reductions in production costs.

7. Finance: Certain plans may achieve policy objectives but are precluded because they require high levels of capital finance or on-going revenue support.

8. Equity: This means ensuring that benefits are equally distributed or targeted to those with special needs. This may involve a social element, such as concessionary fares for the elderly and disabled, and/or a spatial element, such as subsidy for rural services.

9. Practicability: Certain plans may achieve policy objectives but may not be practicable because of lack of public support and/or technological barriers.

Policy instruments are: land-use planning, infrastructure provision, infrastructure management, information provision and pricing, with respect to four objectives (efficiency, environment, safety and accessibility) and three constraints (equity, finance and practicability). (Balcombe, Mackett, Paulley, & Paulley, 2004)

SEA & EIA in transport sector:

The aim is to decrease the Policy-Plan-Program's negative environmental impacts, effective public participation in decision making, and improve the implication of decision making of Policy-Plan-Program.

The essentials objectives of the most transport Policy-Plan-Program are economic, environmental, and social, for example reduction of transport costs or improvements in accessibility and meet commitments or regulations regarding air pollution emission, or protection of the natural environment.

However, the existing experience show a good practice SEA in Lisbon.

4.3. Urban mobility during Covid-19

We live in the time of the SARS-cov2 and its impact on most aspects of our daily life, including transport and mobility, from its broad and comprehensive concept to the smallest details of arranging street furniture…

The Corona series include modifications imposed by the virus, mainly social distancing, the simple ones that can be applied at home, and the largest ones are applied in public building, and transportation...

Public spaces are the most affected, it is necessary to undergo some modifications and changes to cope with the new reality.

How to achieve safer and more sustainable urban mobility going forward?

Public transport is a pillar of sustainable mobility and urban transport systems, but it is being hit hard by the COVID-19 crisis. What needs to be done to rebuild public trust in it and get people using it again post COVID-19?

We are facing the crisis caused by COVID-19. It is a challenging time for all workers, and young workers. They are overrepresented in insecure jobs, have less of a financial cushion to fall back on, and are unable to find stability in this unpredictable atmosphere of work.

Despite all this, it is the time to face the future, and plan for it, arm ourselves with the right skills to thrive in it. We believe that with the right vision, transport sectors can offer quality opportunities and a secure future for many workers, including the younger generation, looking for more security.
We are facing a difficult situation; the world of travel and tourism will change fundamentally. At the same time, as a clever way we have to use COVID19 as an excuse for restructuring. We need to remain active & proactive.
The current crisis has shown us how essential Urban Public Transport for the functioning of society. However, if the urban public transport sector is to continue to offer quality services and thrive, there is an urgent need to plan it with a sustainable way avoiding problems as much as we can.

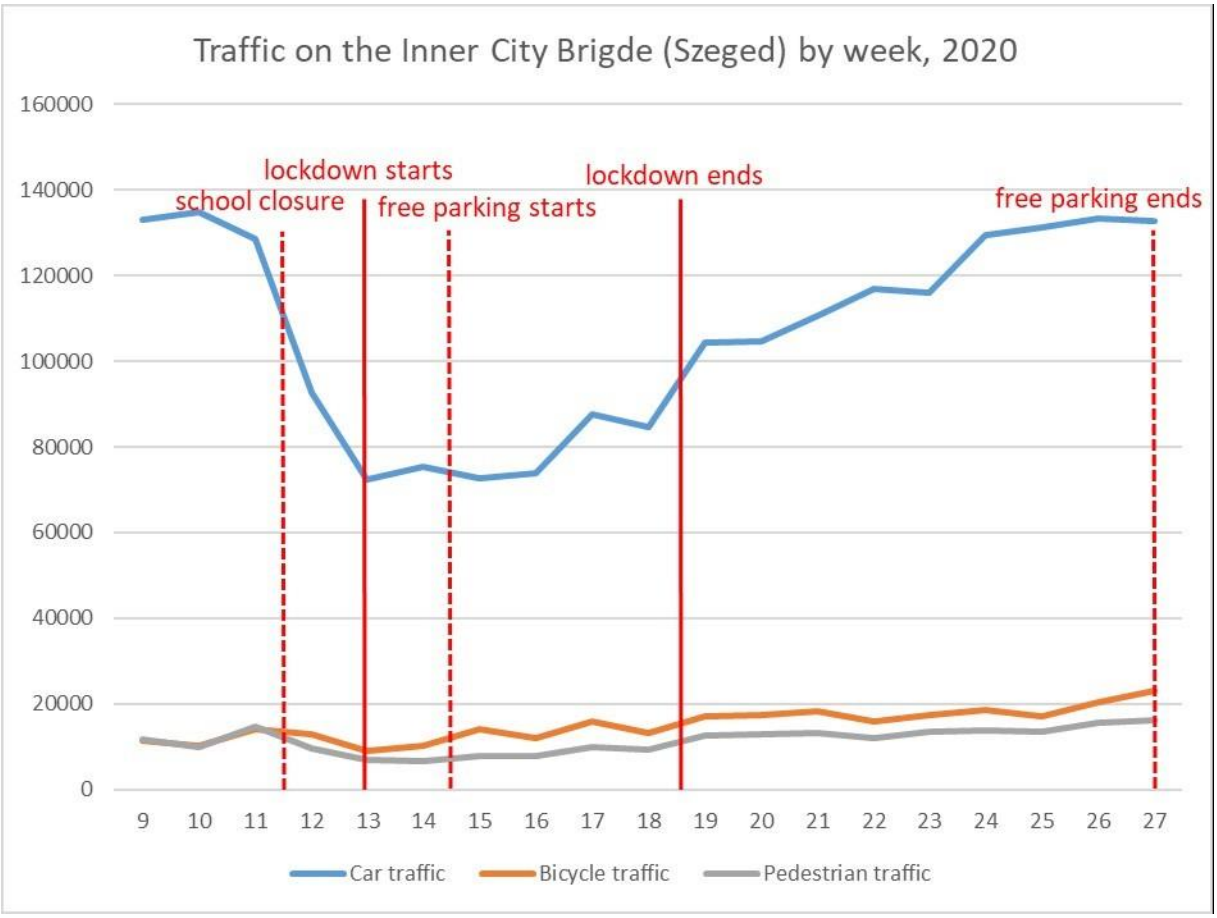


Figure 24: traffic on the inner-City Bridge 2020
Source: www.eltis.org

"As part of the SASMOB (link is external) project, the City of Szeged – a CIVITAS Award-recognized champion of sustainable mobility in Hungary – is working on an intelligent data-driven municipal response system, which will help optimize urban mobility services and provide better information to users and commuters.

Combined with the traditional method based on measuring vehicle weight, these new methods provide reliable results. The results of the automated traffic counting on the City Centre Bridge since late February show the following results:

- The **pre-COVID** traffic levels counted in late February 2020 were about 130 000 cars, 11 000 cyclists and 12 000 pedestrians weekly.
- With the **closure of schools** from the 16 March, car traffic started to fall sharply; bicycle and pedestrian traffic also started to decline

- With the start of lockdown on 28 March, traffic reached its lowest point: weekly car traffic stood at 55%, bicycle traffic at 79% and pedestrian traffic at 59% of February levels. At the same time, the number of public transport passengers fell dramatically to about 20% according to SZKT data.
    - Bicycle traffic started to rise again quickly, due to seasonality (spring weather) and as an alternative of public transport. Pedestrian traffic started to grow too, albeit at a slower pace.
    - Car traffic started to grow slowly after the introduction of free parking countrywide on the 06 April and the Easter holiday.
- Following the end of lockdown on 4 May 2020, growth in all traffic modes was observed.
- By early July, car traffic returned to its pre-COVID level, while bicycle traffic almost doubled and pedestrian traffic grew by 40% (in line with seasonal trends)." (Gertheis, 2020)

Impact of COVID-19 behind 21 percent drop in new registration of cars in June IN Sweden (Agency, 2020)

The Covid.19 crises found me in Sweden visiting my family. My return to Lisbon was then impossible and so the development of this work there. However, this situation allows me to see what were the consequences of the pandemic in traffic and mobility, as well as to analyze the results of the measures taken by public authorities, both at central and local level.

In June 2020, 26 058 passenger cars were registered for the first time, 21.3 percent less than in June last year, according to the Transport Analysis monthly official statistics on new registrations. This decrease is most probably due to the ongoing coronavirus (COVID-19) pandemic, which means that comparison with the same period a year ago should be made with caution. The decrease slowed somewhat, as there were three more registration days in June 2020 compared to June last year.

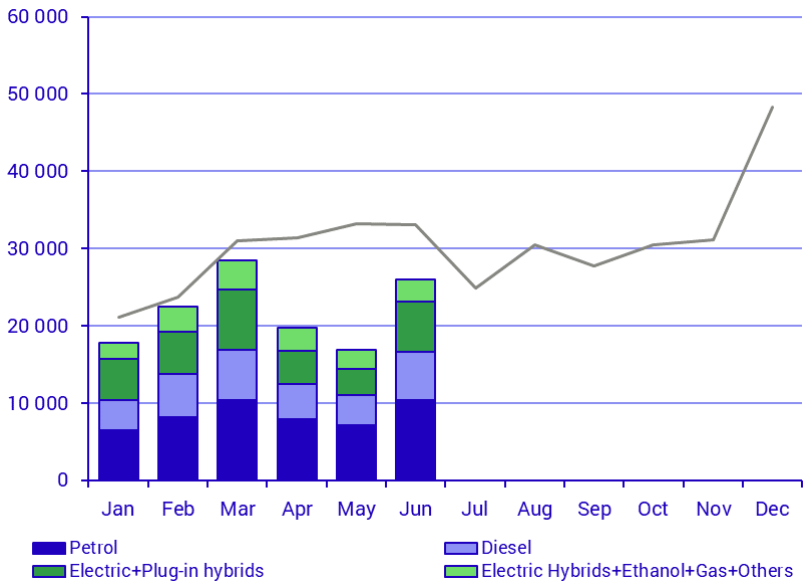


Figure 25: New registrations of passenger cars 2020
Source: Myhr, A. (2020) https://www.scb.se/

Passenger cars defined as a "klimatbonusbil", that is, electric vehicles, plug-in hybrids that emit less than 70g CO2/km, and gas cars (natural, bio- and methane gas), accounted for 24.3 percent of new passenger car registrations in June. Diesel cars accounted for 24.0 percent of new passenger car registrations, down by 8.3 percentage points from the corresponding month a year ago. Passenger cars that are plug-in hybrids, or that run on ethanol or natural gas, accounted for 26.2 percent of new registrations in June, compared with 12.2 percent in the corresponding period in 2019.

New registration of vehicles in January-June 2020

Passenger cars, by fuel type	January- June 2020	January - June 2019	Changes in percent
Passenger cars	131 602	173 805	-24
of which petrol	50 706	78 632	-36
of which diesel	30 788	62 072	-50
of which electric	9 310	8 436	10
of which hybrid electric	15 677	11 963	31
of which plug-in hybrid	23 413	10 883	115
of which ethanol	33	65	-49
of which gas	1 660	1 740	-5

*Hybrid electric includes mild hybrids.

Table 10: New registration of vehicles in January -June 2020
Source: Myhr, A. (2020). https://www.scb.se/

New registration of vehicles in 2020, by type of vehicle

Type of vehicle	January - June 2020	January - June 2019	Changes in percent
Passenger cars	131 602	173 805	-24.3
of which Motorhomes (subset of passenger cars)	2 295	2 606	-11.9
Light goods vehicles	14 012	24 032	-41.7
Heavy goods vehicles	3 179	4 880	-34.9
Busses	766	888	-13.7
Trailers	29 555	27 217	8.6
of which Caravans	2 311	2 214	4.4
Tractors	5 113	5 009	2.1
Motorcycles	8 511	8 112	4.9
Class 1 mopeds	9 472	8 253	14.8
Snowmobiles	3 921	5 294	-25.9
Terrain vehicles	1 886	2 388	-21.0

Table 11: New registration of vehicles in 2020, by type of vehicle
Source: Myhr, A. (2020). https://www.scb.se/

5. THE NEW APPROACHES: INTEGRATION WITH URBAN DEVELOPMENT AND WITH NEW ICTS

Technology is just a mean to achieve the goals. A widely application for information and Communication Technologies (ICTs) have been used in the monitoring, operation and management of transport services, it was proven to have a great potential to increase the efficiency in the use of urban transport infrastructure and also reducing negative impacts on the environment. In Lisbon and other European cities have been applied the ICT to reduce the carbon dioxide emissions and costs.

For this analyzes study of Lisbon, the results show that different ICT applications can have considerable impacts in terms of energy consumption reductions by speed limitation, taxation, and eco driving.

5.1. What are the changes and the objectives?

Information and communication technologies (ICT) change the way people drive and their mobility patterns, thus potentially reducing the carbon dioxide emissions, air pollutants and fatalities. In this dissertation, I study the potential environmental and the economic impacts of implementing ICT measures in transportation of Homs.

ICT can deal with sustainable Transport by Intelligent Transportation Systems (ITS):

- Advanced applications which aim to:
    - Provide innovative services relating to different modes of transport and traffic management.
    - Enable various users to be better informed and make safer, more coordinated and 'smarter' use of transport networks. (DIRECTIVE 2010/40/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCI, 2010)
- Involves three components: Infrastructure, Vehicles, People,
- Optimizes use of the existing infrastructure to save costs.

5.2. The TOD approach in theory and practice

Transit Oriented Development (TOD) is a planning and design strategy that consists in promoting urban development that is compact, mixed-use, pedestrian- and bicycle-friendly, and closely integrated with

mass transit by clustering jobs, housing, services, and amenities around public transport stations. A complex set of relationships can make TOD challenging, because it requires the involvement of many authority: national railroad authorities, organizations involved in land development around transport infrastructure, such as private developers, local authorities, and private companies contracted to provide transit services, even if TOD is only in Post-Expo 98 –Pedestrian Access & Oriente Station but to evaluate TOD, there is good evidence that TOD focused on public transport nodes results in lower levels of car use, somewhat higher levels of public transport use and much higher levels of walking than in conventional suburban neighborhoods, there is clear evidence that land values increase in TOD areas around stations due to their increased accessibility and the greater number of amenities offered in the area.

The benefits of TOD:

- Promoting higher densities and the concentration of jobs within relatively small areas, this concentration creates vibrant communities with high-quality public areas and shorter commuting distances—making cities more livable.
- Urban development and high-quality public transit also mutually reinforce each other: mass transit can support the large passenger flows that come with high density development, while the concentration of jobs and housing around stations helps make public transport financially viable.
- Proximity to mass transit improves access to TOD neighborhoods, boosting their attractiveness and increasing real estate value.
- By concentrating jobs, services, and housing within the catchment area of transit stations, TOD makes public transport a more attractive and efficient option, while reducing dependence on private cars and promoting shorter commutes.

But TOD principles cannot be applied uniformly across an entire city or transit network, since densities of jobs and people vary widely across the urban space. In fact, experience has shown that only about 15% of transit stations and their surrounding area can support very high-density development.

5.3. MAAS potentialities and constrains in Lisbon

There are today many different existing definitions of the Mobility as a Service concept. Mobility as a Service (MAAS) is the biggest transport revolution of the 21st century, it means the integration of various forms of transport services into a single mobility service accessible on demand and put the users at the core of transport services which is being illustrated in Figure 26.

Offers a service through the use of a single application to provide access to mobility, with a single payment channel instead of multiple ticketing and payment operations, It's a bit like different mobile plans. Some users need loads of data. Some don't but need lots of calls. Others don't want a contract but pay as they go. That's why mobile service providers offer a variety of plans and casual options. You get the idea.

The aim of MAAS is to be the best value proposition for its users, providing an alternative to the private car that may be as convenient, more sustainable, and even cheaper. Its holistic vision fosters high expectations. The MAAS service could contribute to improvements in the living conditions and accessibilities of cities and rural areas.

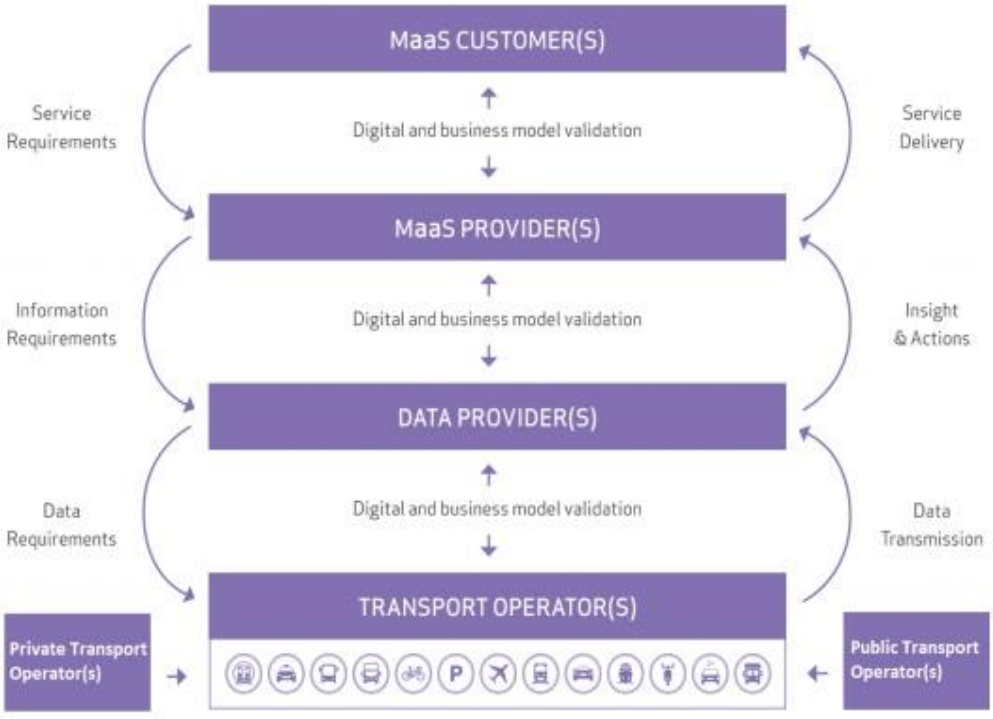


Figure 26: MAAS concept
Source: (J.Datson, 2016)

“In Lisbon, over the last few years, each operator has been trying to improve their users’ experience, as well as facilitate payments and integrate tariff systems. This pushed towards intermodal transport ticketing system, which is used by all the major public transport operators in Lisbon, although it does not integrate any other new transport services, neither does it permit a full digitalization of the travel experience, as a physical travel card is still required. Indeed, the Viva System only enables ticket integration, whereas, on the other hand, the public-owned company that manages street parking in Lisbon (EMEL) has developed its own app for parking in any area of Lisbon, and it also provides bike-sharing technology (ePark).

On the private sector side, the most relevant initiative has been that of Via Verde, which was traditionally a digital payment system for paying motorway tolls, but has now expanded to other services, such as public transport (integrating a privately-operated commuter rail operator), parking, car-sharing, and it has even developed a consumer reward program.

These apps also contain other services, which are essentially related with route planning and real time information that provide users with useful data for their daily travel. These are dominated by the

traditional data aggregators, such as Google, Apple, Waze, etc. Figure 27 present the framework of the transport system of Lisbon, and Figure 28 lists the smart phone mobility apps that are required for its

use and navigate within the transportation system in Central Lisbon.

The organic growth of mobility strategies and the absence of a dominant MAAS operator for the integration of all new services, has led to the emergence of several MAAS options. Transport operators

are not wasting time and are developing their own apps. It is clear that in the medium and long term,

mobility apps and MAAS strategies will merge into truly integrated services.” (Cruz & Sarmento, 2020)

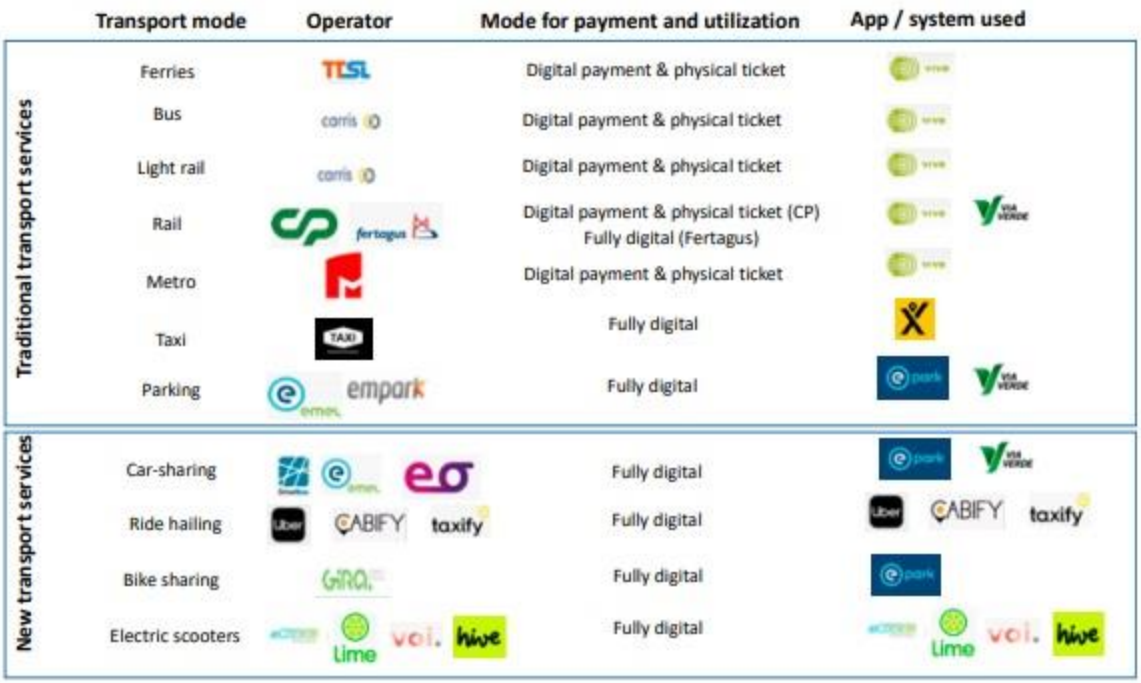


Figure 27: Transport operators in Lisbon.
Source: (Cruz & Sarmento, 2020)

Figure 28: Apps on a Lisbon user's mobile phone
Source: (Cruz & Sarmento, 2020)

SWOT analysis of MAAS in Lisbon:

Strengths	**Weaknesses**
• The development of several apps has allowed a high level of maturity in existing solutions; • The apps are well established, and users are becoming familiar with the digitalization of the transport experience; • There is growth in public transport use (at least up to the COVID pandemic);	• Several solutions that are fragmenting the market and creating an additional complexity for passengers;

Opportunities	Threats
• Mobility patterns less stable and fuzzier, thus requiring more complex and tailor-made solutions; • Familiarity with digital payment solutions is increasing; there is an overall trend digitalization of the economy; decentralization of management (from central to local government), which has allowed for a faster and more effective decision-making process; • Emergence of non-traditional mobility solutions, based on the sharing economy; • The need for decreasing physical payments as a consequence of COVID-19, and also the additional flexibility in terms of mobility that has emerged from the pandemics;	• Reluctance of players to have control over their own apps; conflicting objectives between private and public owned companies; • Unclear regulatory framework and data privacy issues.

However, the regulation of MAAS Services is critical, as these systems will be the pivotal stakeholder for the management and planning of urban mobility systems. The real challenge is how to control data privacy and data usage, and, also how to ensure that this data is readily available for monitoring the performance of the system and each operator, and for contributing to the provision of public policy strategies which are capable of maximizing welfare overall. (Cruz & Sarmento, 2020)

the SWOT analysis for the Lisbon case illustrates, the existing strengths and opportunities outweigh the weaknesses and threats.

Dematerialization and digitalization of the mobility experience is a need, as well as system that allows a closer monitoring of passengers' movements. The recent COVID-19 crisis has provided additional pressure on this pathway.

Figure 29: The 12 Steps of Sustainable Urban Mobility Planning (2nd Edition) – A planner's overview
Source: www.elits.org

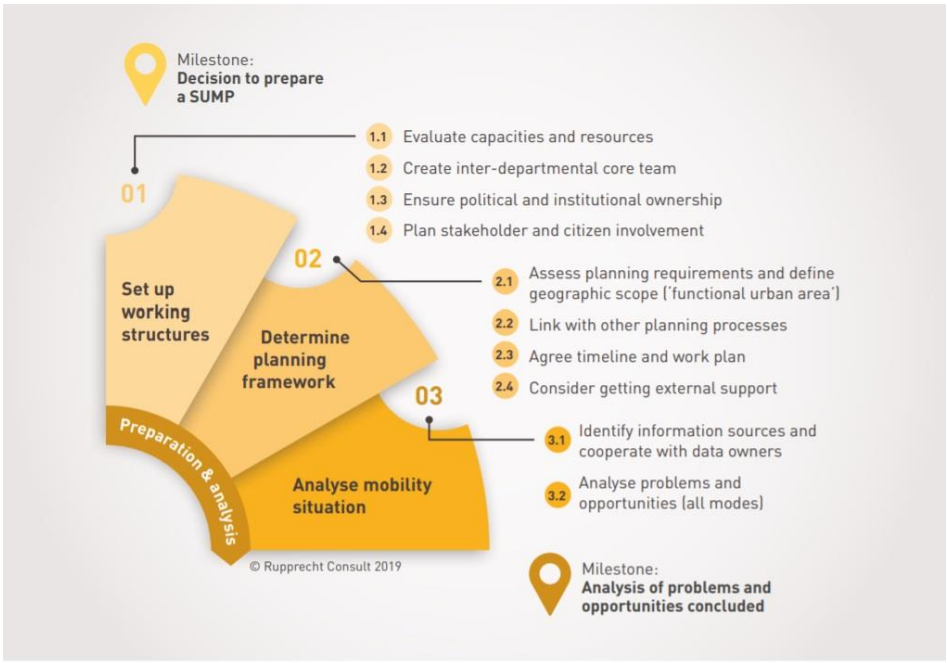


Figure 30: Starting point: Decision to prepare a SUMP
Source: www.elits.org

Differences between traditional transport planning and Sustainable Urban Mobility Planning:

Traditional Transport Planning		Sustainable Urban Mobility Planning
Focus on traffic	→	Focus on **people**
Primary objectives: Traffic flow capacity and speed	→	Primary objectives: **Accessibility** and **quality of life**, including social equity, health and environmental quality, and economic viability
Mode-focussed	→	**Integrated development of all transport modes** and shift towards sustainable mobility
Infrastructure as the main topic	→	**Combination** of infrastructure, market, regulation, information and promotion
Sectoral planning document	→	Planning document **consistent with related policy areas**
Short and medium-term delivery plan	→	Short and medium-term delivery plan embedded in a **long-term vision and strategy**
Covering an administrative area	→	Covering a **functional urban area** based on travel-to-work flows
Domain of traffic engineers	→	**Interdisciplinary** planning teams
Planning by experts	→	Planning with the **involvement of stakeholders and citizens** using a transparent and participatory approach
Limited impact assessment	→	Systematic **evaluation** of impacts to facilitate **learning** and improvement

Table 12: Differences between traditional transport planning and Sustainable Urban Mobility Planning

Source: www.eltis.org

6. CASE STUDIES OF LISBON AND HOMS

The critical question:

What is the reality of applying the indicators of transportation of both qualitative and quantitative terms to improve the level of transport service within the urban environment of Lisbon and Homs?

The specific questions:

- What is the importance role of these indicators for the development of urban plans?
- What are the most important indicators adopted to improve the quality of the urban transport service?
- What is the view of the General Urban Transport Corporation of transport service quality indicators?
- What are the most important obstacles and problems that prevent the application of efficient indicators in the urban areas of Homs and Lisbon.

6.1 The approach of the existing situation (methodology used, surveys, existing plans)

In Syria, public transport systems are poorly and are not responsive to the changing demands of the population. The road infrastructure and the management of traffic are also bad, and congestion is increasing fast, particularly in Damascus, the capital of Syria, and also in Homs. Due to this situation air quality has deteriorated sharply, in great part due to transport, and some key social needs are not reached.

Syria's urban transport does not response its population and economy as well as it should, insufficient supply of public transport services is one of the main problems of this poor performance. In fact, the supply of public transportation (buses, minibus, and public taxi services) in Homs's is equivalent to roughly one-third of the supply in most middle-income countries. As a result, inefficient taxi services have filled the gap left by buses, and private transport modes (mainly cars) are increasing fast. For poor people, walking is the main mode of transport, which heavily constrains their access to jobs and public services.

Minibuses or serves as they are called locally are vans with a capacity of 10 people. These vehicles generally have set routes and set fares. Passengers are permitted to make stops anywhere along this route. Passengers cannot purchase tickets beforehand, instead money is passed to the front of the vehicle

during the journey. Many Passengers prefer the minibus option because they often go to more remote areas than other forms of transport, are far cheaper and leave more frequently.

For a more comfortable ride, passengers could also take an air-conditioned coach run by one of many private companies in Syria. Coaches often make longer journeys than most of the transport between cities like Homs ad Palmyra. Tickets can be bought from local bus stations just before departure. While there are set schedules the coaches rarely stick to them and passengers should always factor in a significant amount of waiting time.

The other main problem is the congestion of the urban road network. In Homs, 50% of the primary street network was congested. Congestion affects people, all aspects of economic and social life. It is a threat to the productivity of the city.

	Lisbon	**Homs**	**Notes**
Metropolitan area	100 km²	104 km²	
Population of metropolitan area	2,956,879	1,336,000	(2020) https://easo.europa.eu/country-guidance-syria/homs
Density	29,554 inhab/ km²	12,846 inhab/ km²	United Nations habitat
Total number of municipalities	18	10	
City districts	24	25	
Weather	Mediterranean weather with high level of humidity	Mediterranean weather with high level of humidity	
Public transport modes	Tram, bus, metro, taxi, train, tuk-tuk, and funiculars	Buss, mini buss, and taxi	
Transport ticketing	Integrated ticketing	Separated tickets and sometimes pay by cash	
Public transport system	Modern and effective	Poorly institutional	

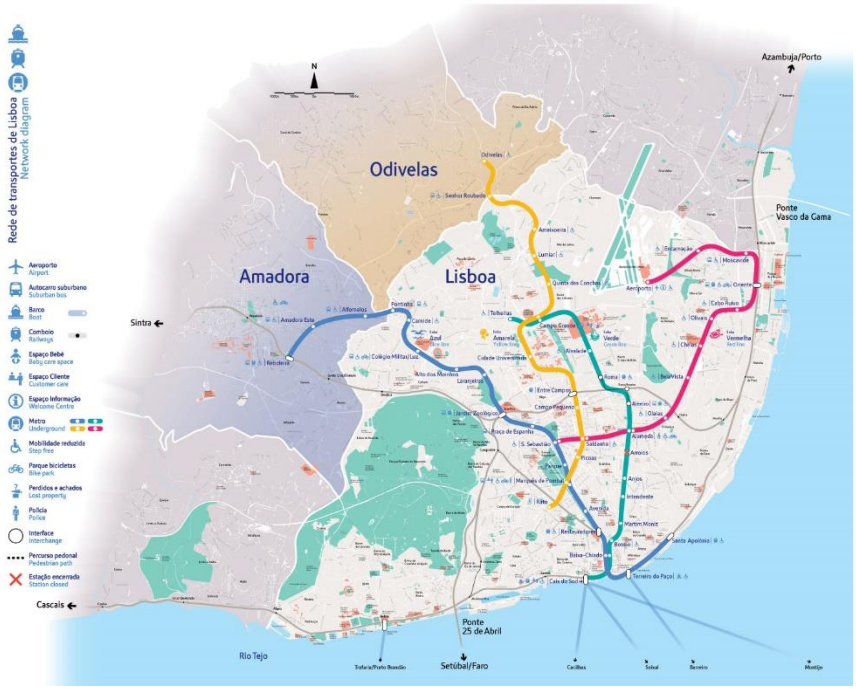


Figure 31: Lisbon metropolitan map

Source: https://www.metrolisboa.pt/en/travel/diagrams-and-maps/

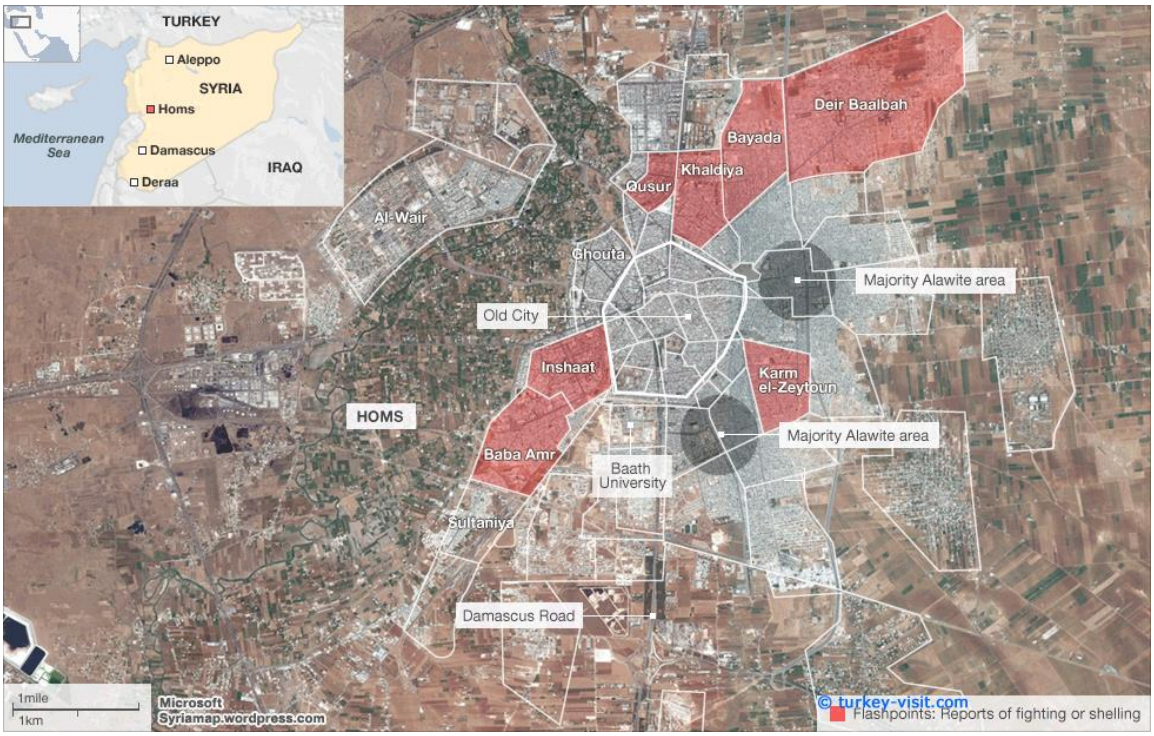


Figure 32: Homs map metropolitan map and Syria

Source: https://www.istanbul-city-guide.com/map/syria/homs-map.asp

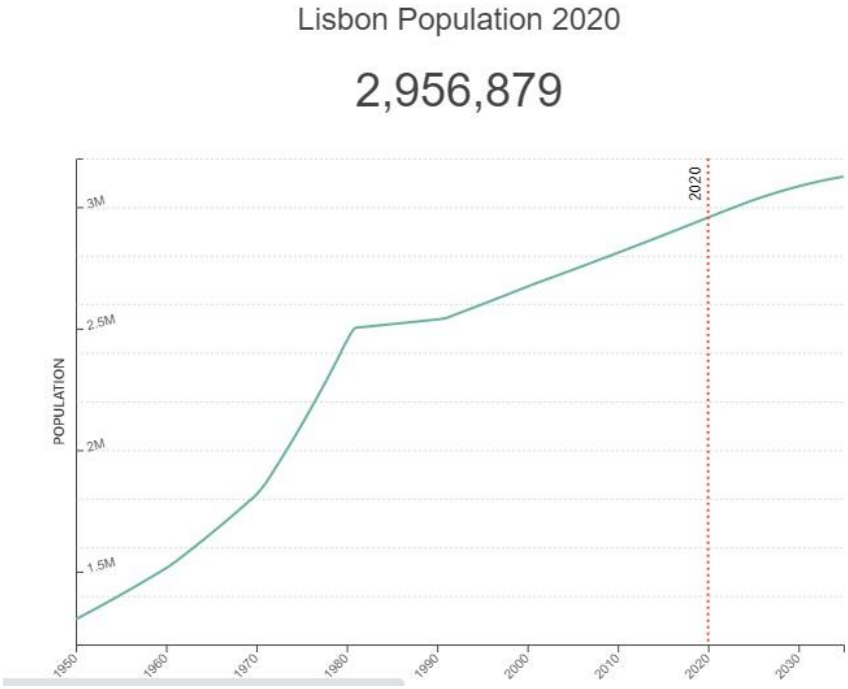


Figure 33: Metropolitan Area of Lisbon, Portugal Population 1950-2030
Source: United Nations - World Population Prospects
https://population.un.org/wpp/

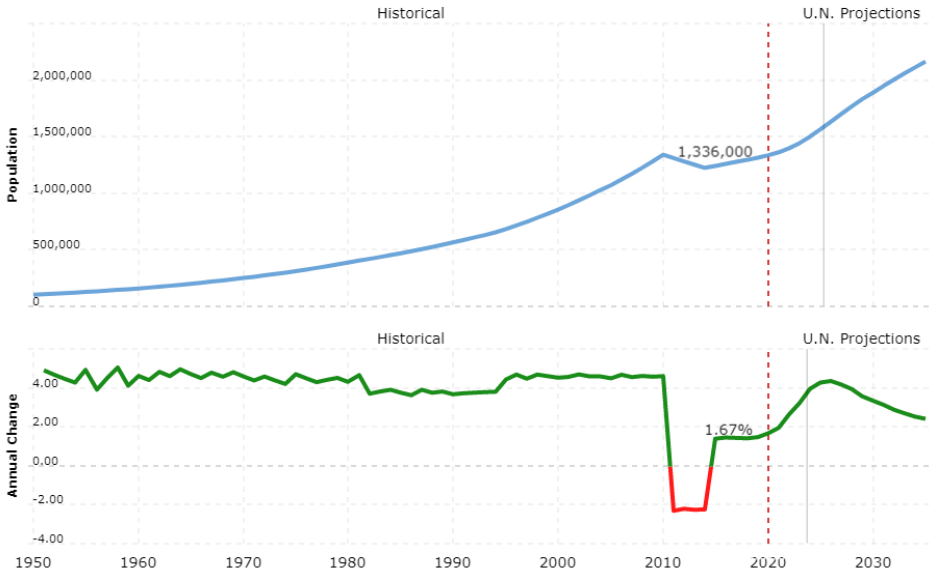


Figure 34: Homs, Syria Metro Area Population 1950-2020
Data Source: United Nations - World Population Prospects
https://population.un.org/wpp/

Figure 35: Lisbon plan with its municipalities
Source: https://capturetheatlas.com/lisbon-map/

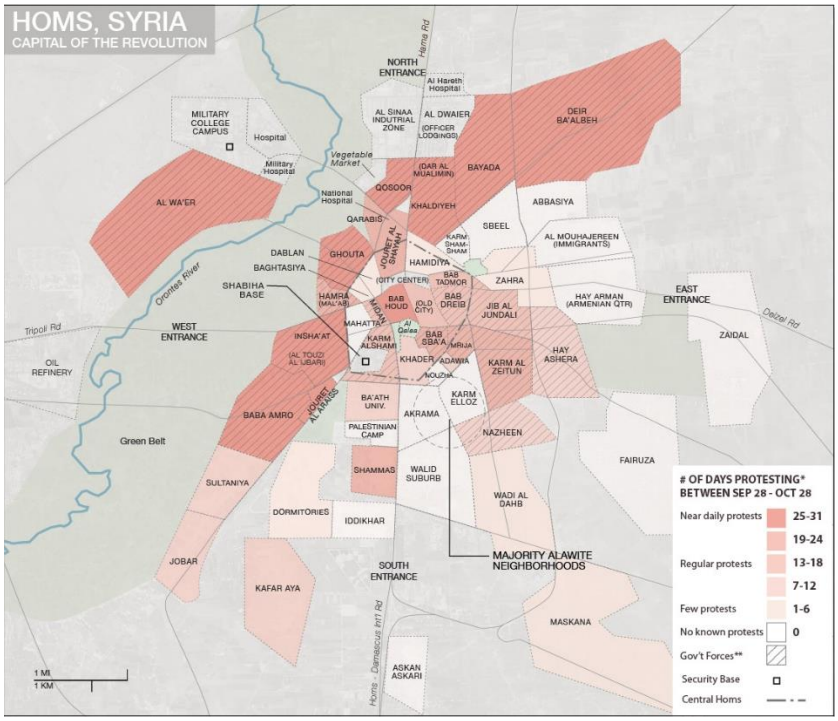


Figure 36: Homs plan with its muncipalities
Source: https://syriamap.files.wordpress.com/2011/11/homs_final_1111081.jpg

<u>The characterization of two cities in details:</u>

Homs:

It is the third largest city by its population and the first one by its area.

City Importance: Occupying central location in the country's transportation network, linking all major urban centers and providing the country with strategic industrial products.

The current metro area population of Homs in 2020 is 1,336,000, a 1.67% increase from 2019.

Birth rate.....23.8 births/1,000 population (2020 est.)

Net migration rate..... 27.1 migrant(s)/1,000 population NA (2020 est.)

In 1950, the population of Homs was 102,285. Homs has grown by 21,449 since 2015, which represents a 1.63% annual change. These population estimates and projections come from the latest revision of the UN World Urbanization Prospects. These estimates represent the Urban agglomeration of Homs, which typically includes Homs's population in addition to adjacent suburban areas.

City urban characterization:

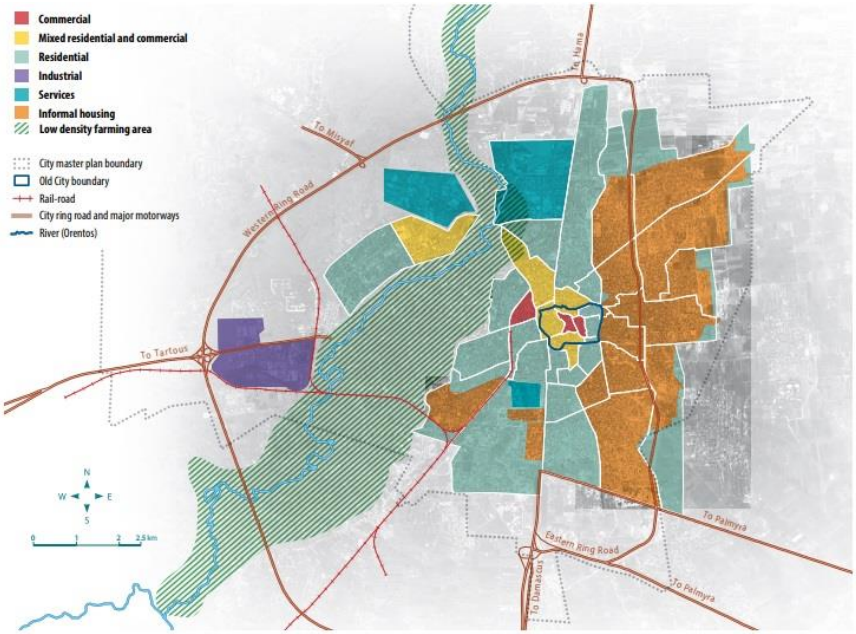


Figure37: Homs City urban characterization
Source: (CITY profile of Homs Multi Sector Assessment, 2014)

The Old City was redeveloped in the 80s and the 90s through modern urban plans that replaced the traditional urban fabric with modern high rise commercial buildings. The remaining Old City Quarter represents only 6.2% of current city area The

Urban functionality levels after crisis:

21 neighborhoods were found to be non- functional, and were effectively de-populated, 6 neighborhoods were found partially functional. This means that 21 of total 36 neighborhoods are no longer functional.

Public transportation system has collapsed in most parts of the city, especially after crisis.

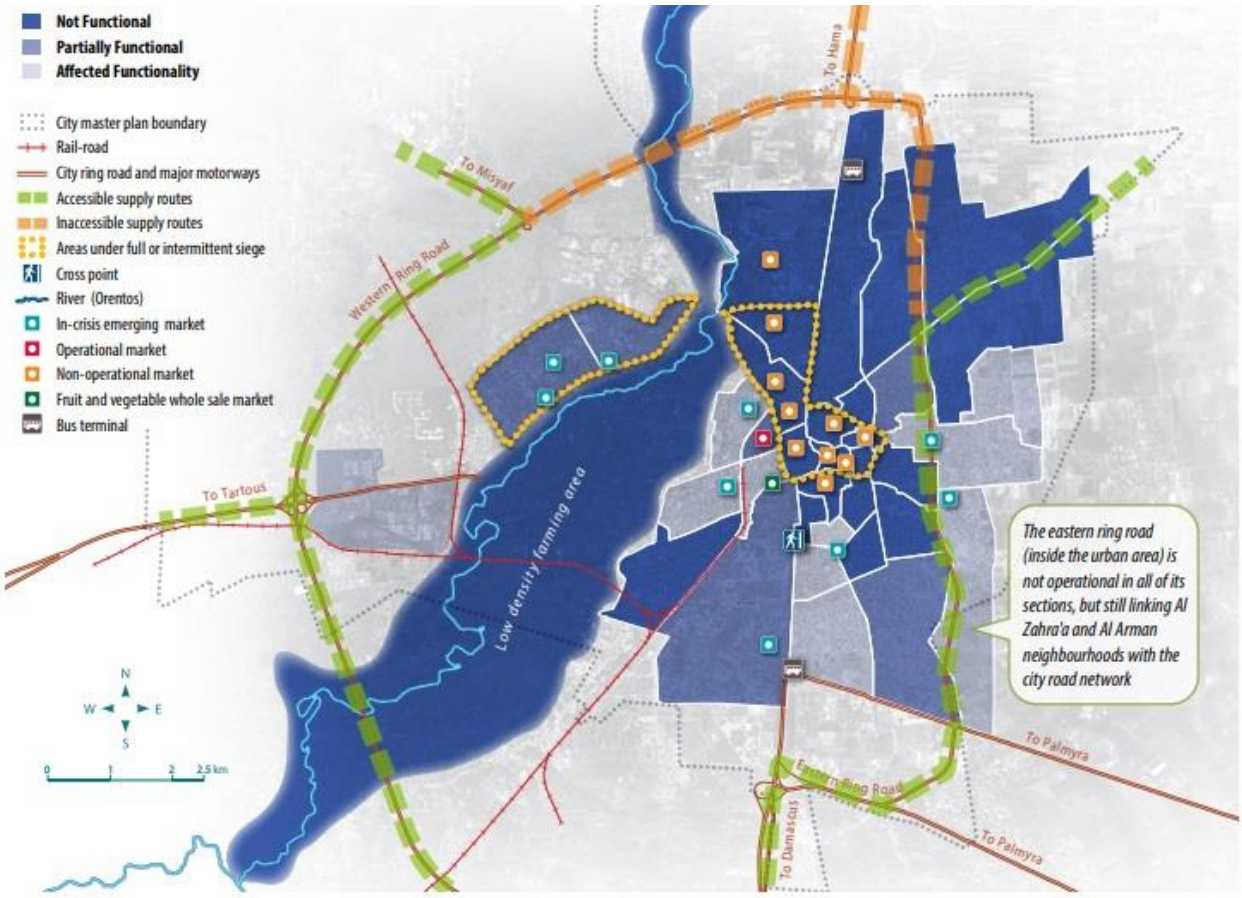


Figure 38: Homs urban function level
Source: (CITY profile of Homs Multi Sector Assessment, 2014)

The evolution of Homs plans:

At the same year of French colonialism's exit in 1946 from Syria, Homs had the first general plan in terms of its content, closer to documenting the current situation of the city. This plan was supposed to serve it until the year 1990. However, it did not take into account the material capabilities of the city. In 1964, the Polish architect Joseph Kujinsky was commissioned to work on modifying the scheme prepared by Doxiades which was adopted in (1967) and it was assumed that it would be the basis for its work until the year 2000.

It did not observe the existing features of the old city in its general lines and did not take into account its specificity. The plan remained far from studies and detailed data that imposed itself during the subsequent stages of the city's development.

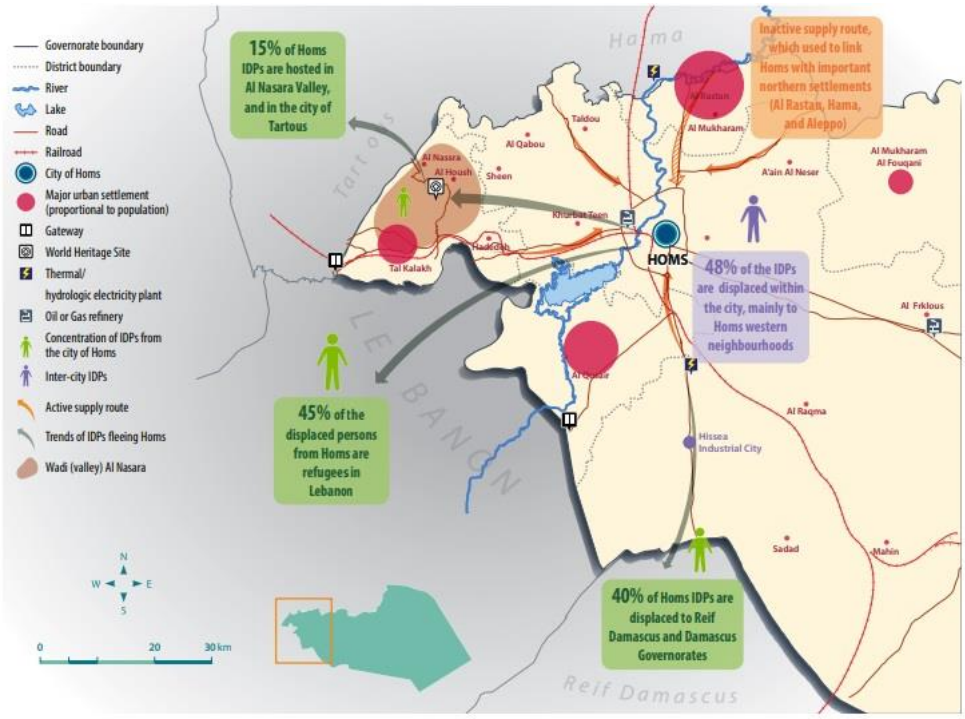


Figure 39: Detailed local plan for Homs
Source: (CITY profile of Homs Multi Sector Assessment, 2014)

The transport sector in Homs has embarked on a broad program of activities aimed at systematically addressing issues, is organized under three main applications:

1. Improving the transport sector's management: the foundation of urban transport planning and management agencies for each large urban area, so that each area can have multi-modal urban transport strategy and priority investment plan;

2. Developing the supply of urban transport services and infrastructure, this means ensure that it efficiently serves the population's demand, and improve coordination between various public transport modes; and

3. Seeking and improving the environmental and social sustainability of urban transport, this means making urban transport more climate friendly.

The Lisbon underground system has continuously been expanded and upgraded since its construction in the 1950's, The Metro started is operation in Lisbon in December 1959 and the decline of tram use in Lisbon started in the 70's. "In Lisbon, analysis and evaluation Subway extensions have diverse rationales, which can be seen the areas raised earlier:

1. improvement in transport accessibility to existing socially deprived and social-housing districts and to large-scale urban facilities; and

2. capacity to trigger urban regeneration opportunities (i.e., mixed-use urban facilities and public-space amenities) with impact on socially deprived areas.

Nevertheless, five types of subway-expansion impacts on social equity can be sketched:

1. Direct benefits through subway line development across low-income areas (e.g., Chelas and Reboleira) and improvement of overall accessibility to urban centers;

2. Indirect benefits from increased intramodality and accessibility to peripheral districts, improved accessibility for lower- and middle-income commuters, new market-oriented middle-upper income urban development projects across the line, and/or other benefits to existing middle-income districts across the line (e.g., Pontinha-Reboleira and Campo Grande-Odivelas);

3. Conflicting impacts from increased intermodality and accessibility when accompanied by gentrification (e.g., central downtown districts including Baixa, Cais do Sodré, and Santa Apolónia); and

4. Limited impacts from transit-oriented development (e.g., Oriente-Airport).

As a result, socio-spatial equity rationales appear to have had a secondary role on the various stages of subway expansion strategies in Lisbon, and deeper combination between these strategies and socio-inclusive development rationales are necessary to deliver better citywide social equity indicators." (J., D., & F, 2020)

Homs's Transport Weaknesses:

- Efficient planning, coordination, and management of the urban transport sector: No bus route network restructuring Plan.
- Effective coordination of policies and programs among the main Government departments involved in the urban transport sector.
- Sufficient urban transport expertise is available in the cities that have carried out or launched the preparation of their urban transport strategies and priority investment plans: No expert and no city have yet benefitted from the training program.
- Improved quality and quantity of bus services in all urban areas and suburb of Homs: No service supplied at the outset.
- Accessibility for persons with limited mobility has been mainstreamed in urban transport projects and awareness has increased: No city with accessibility project Component.
- Today's pressures: Air pollution (1.3 million premature deaths/yr) , Climate change (27% of carbon emissions) , Road safety (1.2M casualties/yr, 90% in developing world) , Energy costs and subsidies (>2% annual growth since 1970, Syria is suffering the fiscal burden of energy subsidies) , Social equity (equitable access to education, employment, health facilities, friendly public spaces & urban planning, etc) (Ribas-Mateos, 2017).

Lisbon:

Throughout its history, the location of Lisbon, positioned on the banks of a large harbor at the periphery of Europe, and sheltered from the ocean, has been one of its major defining qualities: shaping its character in providing the opportunity for cultural exchange.

The Lisbon transport network works smoothly, although at times it could benefit from a higher frequency of service, it is relatively punctual.

Policy Background of Lisbon:

The framework for research and development (R&D) policy in Portugal was laid out in the partnership agreement 'Portugal 2020' between Portugal and the European Commission, adopted in 2014, Strategy relevant to transport is featured in Portugal's National Energy and Climate Plan 2021-2030. (Transport Research and Innovation Monitoring and Information System, 2020)

Lisbon aims to become smart, sustainable, competitive, participatory, creative, innovative and citizen-centric. it has drafted an urban development strategy for the coming decades, and has committed to invest Eur 307 million in related projects (Programa Operacional Regional de Lisboa 2020).

The transport system in Lisbon is responsible for over 31% of city energy consumption and 40% of GHG emissions.

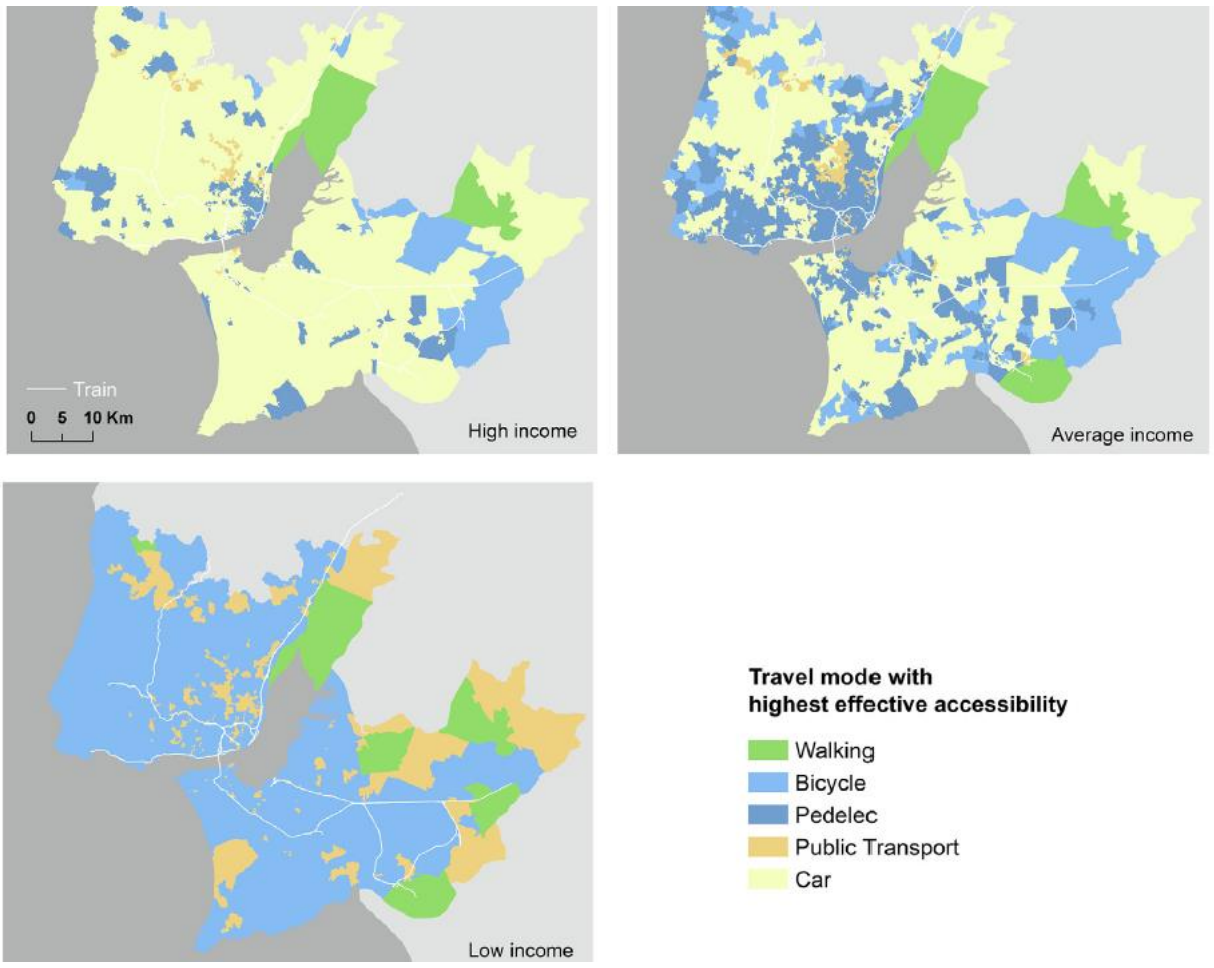


Figure 40: Travel mode with the highest effective accessibility by income level.
Source: Vale, D. (2020). Effective accessibility: Using effective speed to measure accessibility by cost. Transportation Research Part D: Transport and Environment, 80, 102263.

We notice that there is a relation between travel mode and effective accessibility by income level according to three main situations:

First, the fastest transport mode is based on the income of the individual. For example, the car for high-income individuals is the highest transport mode. Second, Public Transport is, in most cases, slow, it will only be the choice of captive users, mainly low-income individuals. Finally, the fastest mode depends on the location of the origin and destination. In suburban areas that are distant from the destination, only an integrated bike-and-train mode would provide a real alternative.

Complementary measures, such as dedicated parking and/or low emission zones should be implemented to make these cars more competitive. Another important issue is investment in a better PT system, as all PT measures highlight poor accessibility throughout the LMA.

As it shows in figure 40 here about transport in Lisbon. In the Portuguese capital and its suburbs, it will be very easy for you to move. The transport offer is varied and dense and will allow you to go close to all points of interest. The important thing is to have in possession the maps and transport plans of Lisbon that you want to use, so as not to get lost in this rather complex transport system. In Lisbon, it is possible to travel by metro, tram, bus, funicular, train but also by boat and taxi. As far as transport tickets are concerned, you will see that it is possible to make your life easier with the purchase of a pass that runs on all transports in the capital. And be aware that most of Lisbon's transport remains relatively inexpensive compared to other European capitals.

In this figure 40 we can see Lisbon multi modal passes for urban public transport: a successful product under attack in: integrated revenues and ticketing systems for rail and road passenger transport.

A change in the tariff framework of urban public transport in Lisbon was made with the creation of multimodal monthly passes, these passes allowed free transfer between different modes of public transport services.

Figure 41: Lisbon multi modal public transport system with a large array of options
Source: (Application Form for the European Green Capital Award 2020, 2020)

Amongst the measures that have been implemented over the last years to promote sustainable mobility in Lisbon, the following deserve notice:

- Conversion of several streets into pedestrian areas, promoting and defending walking and local commerce;
- Development of pedestrian routes linking historical neighborhoods, including mechanical apparatus (several vertical lifts and funiculars) in hilly historical areas where car circulation is difficult and cars were mainly parked on sidewalks;

Figure 42: Traffic have been constantly reduced improving green mobility, the joy of public-space and better
Source: (Application Form for the European Green Capital Award 2020, 2020)

- Programme of the “One Square in each Neighborhood” plaza program, defining 150 city squares for public space requalification, mostly for pedestrian use, 21 of which have already been implemented;
- Implementation of school mobility programs, such as safety projects, Pedibus and Bike to School;
- Promotion of walking and cycling events, and cultural street actions involving public transport;
- Development of a cycle infrastructure network, with 90km of dedicated bicycle paths and protected lanes linking important urban areas of the city, including 6 pedestrian-cycle bridges to overcome important physical barriers (freeways, arterial roads, railways, and deep valleys) and metal ramps on stairs;
- Integration of bicycles with public transport, with the implementation of rules that allow bicycles to travel free of charge on all urban, suburban and regional trains, subway, boats and several bus lines, and the installation of bike racks onboard and on PT interfaces;
- Dissemination of large amounts of public equipment for safe bike parking throughout the city;
- Creation of partnerships with local cycling associations to promote bicycle use and private company involvement in the dissemination of bicycle mobility support infrastructure;
- Promotion of walking and cycling events, and cultural street actions
- Delimitation of 4 car restricted areas (with physical remote-controlled barriers) in historic neighborhoods, only allowing access to residents and local shop owners;
- Delimitation of Low Emission Zones (approximately 30% of Lisbon territory) centered in the downtown areas, where private vehicles can only enter if they comply with a certain Euro standard
- Reform of EMEL, the municipal parking company, to regulate car parking in the city, restricting car use by commuters, taxing public space use for parking, creating resident zones and promoting surface parking. (Application Form for the European Green Capital Award 2020, 2020)

Lisbon’s cycling infrastructure has been developing constantly since 2009, with strong focus on the city core since 2015, only in 2017 has the bike started to be considered a real mobility alternative for many people.

Cycling appears to be a fundamental pillar in the renewed mobility system. Indeed, Lisbon proposes to become a cycling city, aim at making the bicycle easy and attractive transport mode, increasing in turn its share in the modal split.

Figure 43: Some of the cycling infrastructure built during 2017 on main city axis
Source (Application Form for the European Green Capital Award 2020, 2020)

6.2 Main policies and projects under way and analyses its results

In Lisbon, Portugal there will be an International Conference on ICT for Transportation on 15-16th of April, 2021, aims to bring together leading academic scientists, researchers and research scholars to exchange and share their experiences and research results on all aspects of ICT for Transportation. It also provides a premier interdisciplinary platform for researchers, practitioners and educators to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions adopted in the fields of ICT for Transportation. (Conferences in Lisbon, 2021)

The City has also defined a 3-year strategic plan that includes: 60M€ CAPEX; 250 new buses (mainly natural gas and electric), 220 new drivers; 21 new neighborhood lines; 7 new BHLS lines; free Wi-Fi on all buses/trams; new App (already available) with real-time info.

The analyses: From the analyzing, it is evident the lack of a comprehensive methodology that could estimate in detail and with accuracy the effects of such measures. The use of simulation models contains various uncertainties while combined with the absence of relevant and organized data make the whole procedure costly and lengthy.

Future Plans of Lisbon has a clear vision of the urban development model to pursue. This vision is cohesively embedded into the improvement of public space and in the definition of a new multimodal integrated mobility system. The main objective is to have a people friendly city that guarantees that anyone, anywhere in the city, can access at least two different sustainable, efficient, comfortable, safe and inclusive modes (alternative to private cars) within less than 500m.

Figure 44: Lisbon Mobility Strategic Vision organized in 10 mobility networks and services
Source: (Application Form for the European Green Capital Award 2020, 2020)

Lisbon Mobility Strategic Vision (MOVE Lisboa) set guidelines for the design of a coherent mobility and accessibility system, aligned with the Density/Diversity/Design approach.

So, I can conclude that ICT interventions in transport networks can be beneficial in terms of carbon dioxide emissions and costs reductions and they can become an important tool for local authorities and policy-makers. However, further research is required in exploring the potential effects of combining different measures in the same areas and in overcoming the barriers of assessing the implementation of a good practice in a new area.

It is important when applying a particular polices: halting population movement is the first step in Syria, but I notice that in Portugal nothing stop, there is always alternative application to let people continue their works with a slight change of using public transport.

6.3 The need to apply efficient public transport in Homs

The data analysis questionnaire is about the transport sector and Homsian people satisfaction with the passenger transport services with 18 questions, was based on the carefully selected responses from the

online survey. There were 375 responses received, however I was very pleased to get certain feedback from planner experts. In general, they are living in Syria, the most of them in Homs.

The online survey result shown that 69.9% respondents agreed upon the point that unsatisfied using the public transport in Syria. Additionally, only 8% are satisfied as it shows in chart 1. Indeed, this means that public transport needs a lot of application to improve it, this justifies the high rate of using private car instead of public transport. So, it is necessary to have a good planning and analyzing to reduce the use of cars to improve the environment and access sustainability.

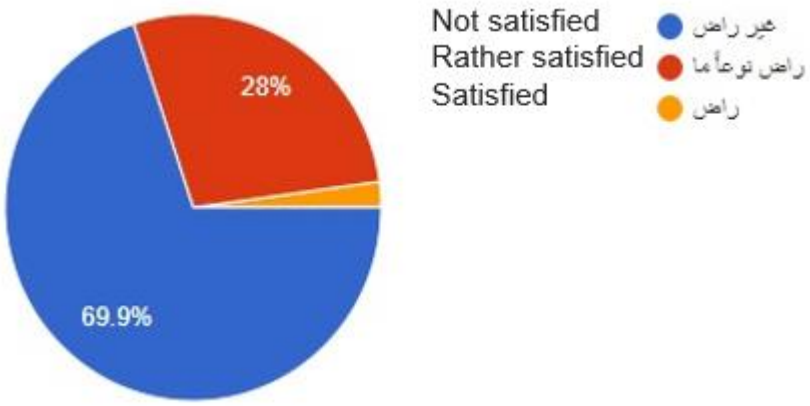


Chart 1: Are they satisfied of using public transport in Homs

Source: My questionnaire

When the question about the most important obstacles and problems in public transport, most of them considered it is ineffective system in its infrastructure (30%), unsecure (27.2%), does not respect time (56.5%), not comfort (84.3%), does not care of social aspects, there is no enough number of public transports means (74.1%) as it shows in chart 2, and does not take into account people with special needs (60%), also does not provide information when there is a problem with their lines or about the trips(80.5%) as it shows in chart 3.

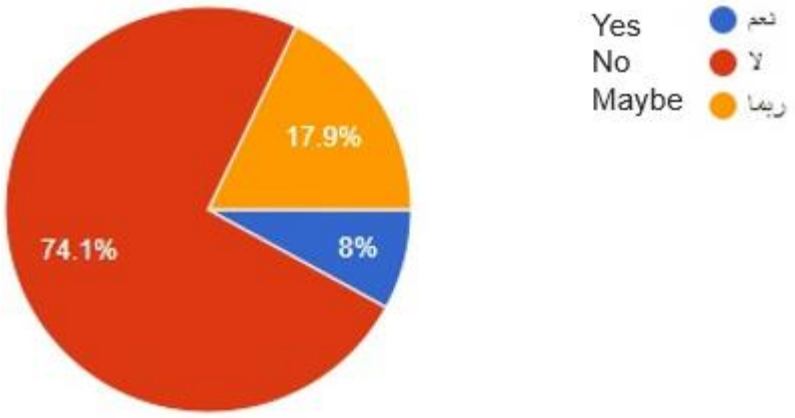


Chart 2: Responses if there is enough number of public transport means

Source: My questionnaire

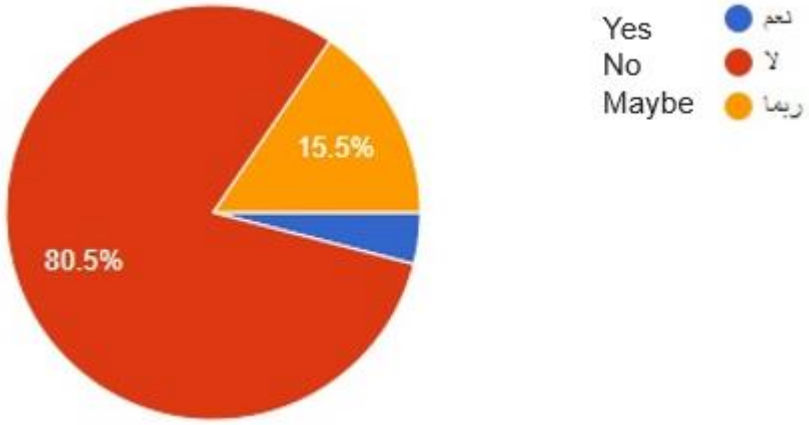


Chart 3: Do you provide with trips information or when there is a problem in public transport modes

Source: My questionnaire

When the question about the most usable means of transportation in their daily life, the most answers 64.8% are buses and sometimes walking 28.3% due to the cheap price of the ticket, also there is no other option to use, especially there is a high percentage that they are using public transport daily 52.8%, after that in the absence of another transport mode as it shows in chart 4.

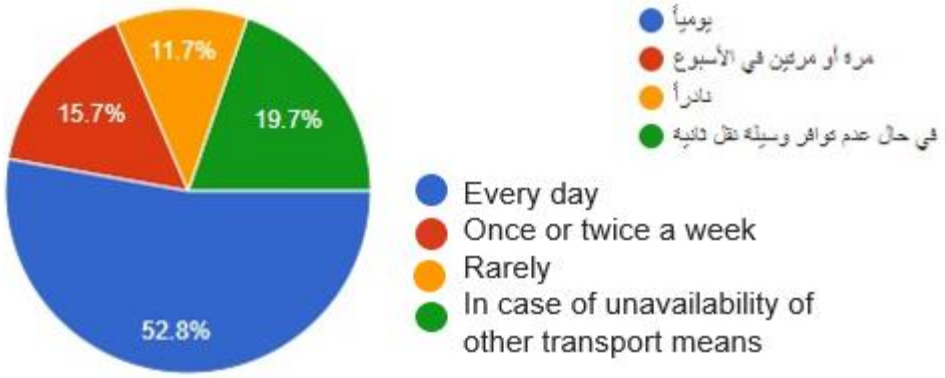


Chart 4: How many times that they use public transport

Source: My questionnaire

The other thing that the transport technology is not exist yet (80.3%) as in the other world, due technique problems and costs, as it shows in chart 5.

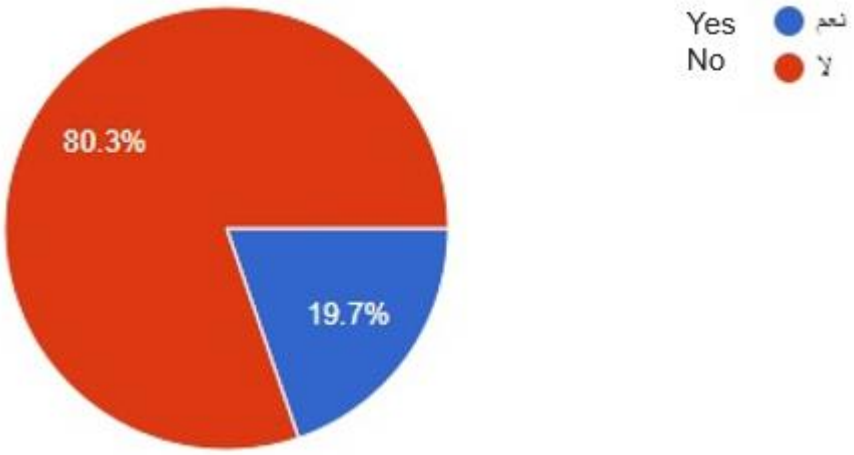


Chart 5: Are you using transport technology or transport apps

Source: My questionnaire

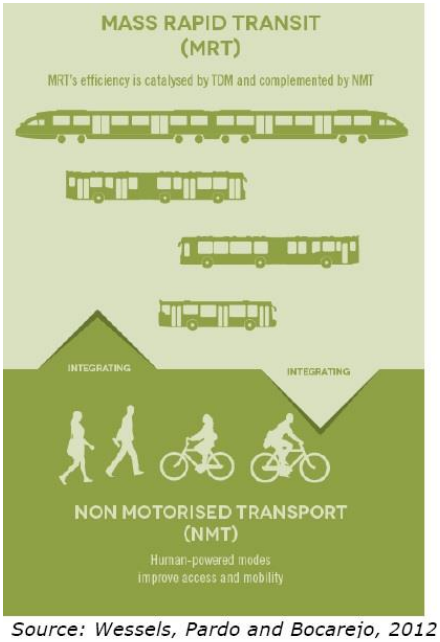
The results of the final question “What solutions do you think to improve public mobility?” The high percentage is to use the rail transport or metro (47.2%), organize all transport modes to be sustainable (54.9%), improvements for public transport infrastructure (63.5%), and supply the transport mode with a high quality of WIFI with smart transport applications (32.8%). In addition, a lot of solutions to increase the number of transport modes and the expanding the road network.

Based on the respondents' answers there is no single solution to public transport problems, and to achieve sustainability in a transport system, to develop transport strategy, it is important know what are the objectives of this strategy which a city is seeking in its transport system by decision makers.

The objectives to achieve in sustainable transportation are highlighted in a previous chapter, including protection the environment, safety, equity and social inclusion, economic efficiency, contribution and economic growth. Usually, it is not possible to reach all of the objectives which may be desirable.

Main intelligent transport services that can be applied:

1. Traveler information (supporting pre-trip and on-trip travel decisions)
2. Traffic management (to reduce the demand for motorized travel and to give priority to buses, non-motorized vehicles (NMVs) and pedestrians)
3. Freight transport management (administration, safety inspection, fleet management, etc)
4. Public Transport management (system optimization, etc)
5. Electronic payment (multi-modal transport ticketing, tolling, bicycle and car sharing schemes, congestion charging, etc)
6. Safety and security (emergency management)



Source: Wessels, Pardo and Bocarejo, 2012

Figure 45: Motorized transport and non-motorized transport

To ensure sustainable transport policies, they need two important aspects:

- To be designed to be compatible with and contribute to sustainable development,
- And to be acceptable to the public.

Application after analyzing the report of the questionnaire:

Bus lanes should be separated from other lanes. If bus lanes are unnecessary for the present period, the designer can reserve areas for future bus development by using median strips. Such a strategy is useful because existing roads are inherently overloaded, which may cause obstacles in the adjustment of roadway dimensions for forming dedicated bus routes. Constructing new bus stops or improving existing bus stops is an essential design facet to improve bus service quality and thus encourage passengers utilize bus systems. At each bus stop, facilities such as enclosed shelters, bus turnouts, lighting, seating, the itinerary, and timetable information can be provided to enhance commuter safety and convenience.

7. CONCLUSIONS

7.1 Proposals to improve the transport system

- Priority option for promoting sustainable transport in the Arab world

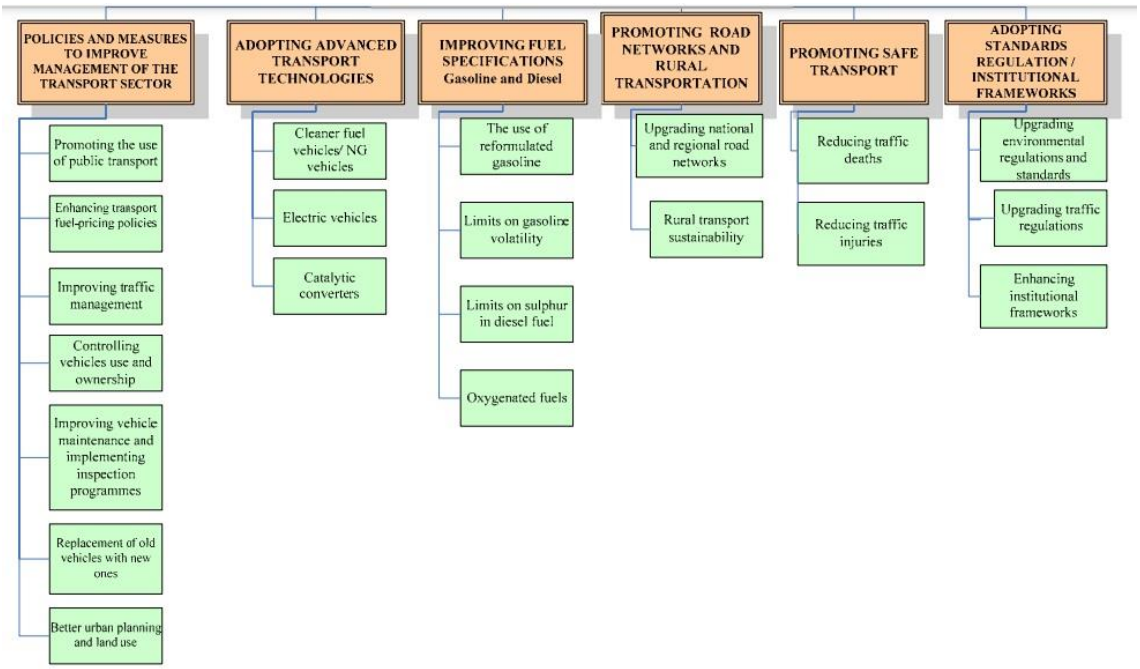


Figure 46: Priority option for promoting sustainable transport in the Arab world
Source: (Arab Forum for Environment and Development (AFED) with Technical Publications and Environment & Development magazine, 2011)

- First application, to implement the effects of limiting driving speed. Non-commitment with speed limits results for a large of fatal car accidents, and therefore understanding the compliance of such applications is essential in the transportation safety policy. Hardness speed limits can be gotten either by on-board vehicle devices impressing the driver not to exceed certain speed limits or on the road network forcing lower speed limits.

- Second application, the impacts of an eco-driving behavior. In this case, how the impact of eco-driving by public using ICT to present the drivers with the results of their behavioral changes.

- Implementation of a taxation system based on on-board vehicle or among the road devices that mention all data of the vehicle is being driven and punishment the driver for it.

- In the early 1960s, Lisbon's subway network was built in accordance with the main axes of the concentration of jobs, commercial activities, and population at the time: the downtown perimeter of the Baixa neighborhood. Two extensions along Avenues Liberdade and Almirante Reis towards the plateau in the northern part of the city connected Baixa to the most important middle-class residential areas and significant social facilities, such as university campus and colleges (J., D., & F, 2020). The same beginning it would be applied in Damascus or Homs.

- After analyzing, I suggest an idea to exchange on Urban Transport that allowed for mutual learning and training between Syria and Portugal as Mediterranean countries by events, will be organized by the government authorities and international organization, as the exchange between universities.

- MAAS application

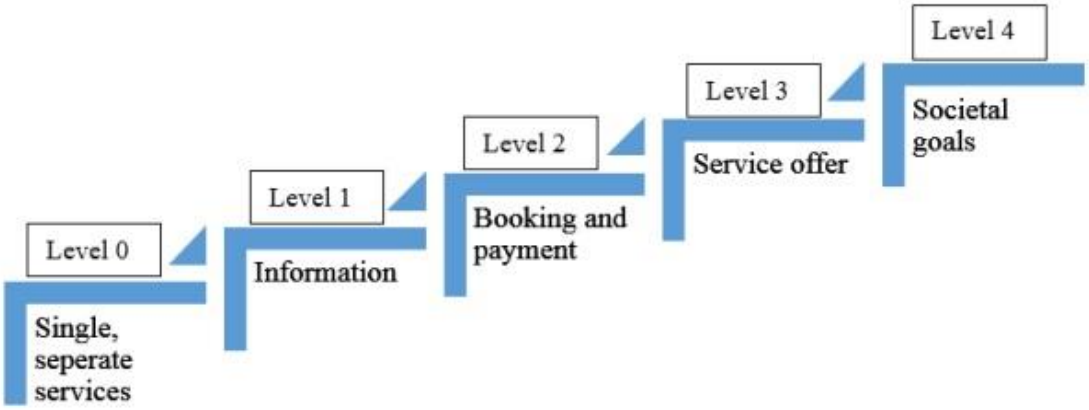


Figure 47: MAAS integration levels derived
Source: (J.Datson, 2016)

Homs is in the 0 level of MAAS integration or the basic level corresponds to a stage where the integration is absent, and the provided mobility services are handled separately from each other.

At the beginning, Homs has to start with level 1 that refers to when information is shared and provided via i.e., travel planners. It adds value since information about routes and travel time facilitates a flexible offering for users (J.Datson, 2016). Since this level only focuses on single trip information, people that are using such a service are viewed as users rather than customers. Additionally, a MAAS operator at this level is not responsible for the quality of the service of providing information, but do not have a legal responsibility of the information itself (Sochor, 2017).

Another important thing is to design the streets to load all these function in a organized way, The image shows how wide a main thoroughfare must be to accommodate all of the functions. A typical main thoroughfare in Lisbon is between 20 and 30 meters wide.

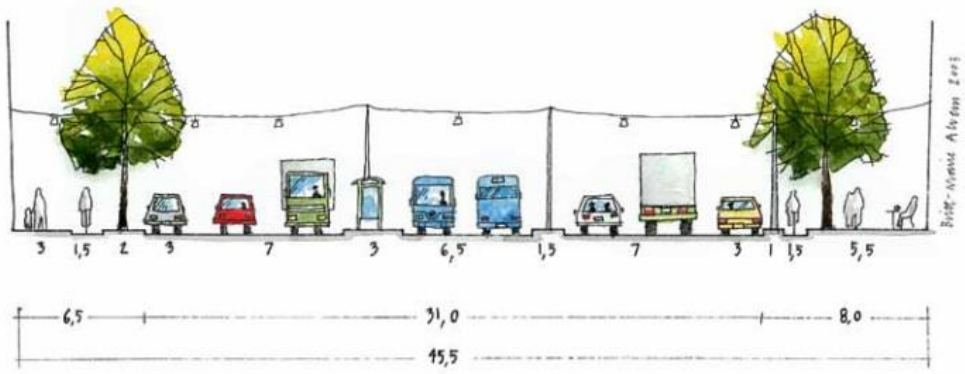


Figure 48: Main street accommodate all of the functions
Source: Lisbon transport infrastructure (Application Form for the European Green Capital Award 2020, 2020)

7.2 Critical aspects to move forward

Nowadays we must achieve Sustainable Urban Transport Planning for its impressive intermodal transport solutions with a people-friendly focus and its excellence in linking transport planning with the overall urban planning process, while considering accessibility for different social groups.

The analyzes show that different ICT applications can have considerable impacts in terms of energy consumption reductions

Integrate urban and transport plans, bringing experts and planners together across different levels of government makes it easier to develop more efficient, complementary plans. Portugal's National Land Transport Strategic Framework, for instance, provides local governments with a clear overarching framework to support integrated spatial and transport planning within urban areas.

If electric vehicles become more popular, road pricing will become less important in addressing air pollution and carbon emissions, and more important for tackling congestion, so that road pricing not only deters cars but also helps to make alternative modes of travel more affordable, efficient, and pleasant.

The previous planning models enlarged the actors in the city, were not applicable and moved away from realism, and did not work to integrate the private sector and civil society in a consensual framework that contributes to creating a common strategic understanding and a general perception of

their city. Also, the intellectual environment in which you operate is a changing environment that needs to be kept up for the results to be practical and realistic.

So, Homs transportation planning needs:

- Integration of transportation and land use planning,
- Telecommuting (teleworking, e-government services, etc.),
- Shift to more environmentally modes (non-motorized transport and mode shift to public transport),
- Improve energy efficiency of transport modes and vehicle technology and raising awareness (low friction lubricants, speed limits Eco-Driving and shift to alternative fuels).

Expanding activity into sustainable transportation as a cross-cutting field in Homs:

Monitoring success stories in Lisbon.

Transportation in the contexts of Green Economy, and Green ICT, through studies and projects implemented in Lisbon.

Sustainable transport policies have been more commonly implemented in Europe than in the Arab world. Some policies have witnessed success while others have not.

There are several challenges to improve the transport sector regarding to these charts and tables in the Arab world, one that there is a lack of technical expertise on new technologies that would allow the production of cleaner fuel, the upgrade of fuel specifications and the enhancement of transport systems. Moreover, the lack of data also makes the implementation of efficient sustainable transport policies difficult.

In addition, assessing the strategies being considered to increase public transport usage, it can be concluded that such policies aim at increasing the using through offering easy, quick, and affordable access to public transport modes in addition to enhancing vehicle technology.

Public transport has also proven to be a successful GHG emission reduction strategy, in order to increase transport usage, policy-makers try to make the overall public transit experience quick and easy to use through the implementation of smart travel cards.

The strong mandate from the national government to the transport authorities is essential, as poor coordination across different level of government and service providers can otherwise undermine the effectiveness of the application.

Public infrastructure projects can reinforce real estate values and create major new business opportunities. Governments are exploit this to generate revenue for those projects by taxing the rise in land prices.

Over the past years, transport planners have tended to focus on reducing congestion to improve people's mobility within cities. We have to build a city with cars not a city for cars, because the increasing road capacity, vehicle speeds and parking spaces have not solved urban traffic. Building more roads and parking just attracts more cars and locks cities into expensive, unsustainable sprawl.

Wherefore, transport planners and government authorities in Homs are recognizing that they need to work more closely with other sectors to improve accessibility within cities, like Lisbon case of study and other European cities, they offer a high quality of life built around vibrant, walkable neighborhoods linked by efficient, high-capacity public transport.

Changes in transport behavior and lifestyles such as the use of smart phones, mobile web applications and social media together with the trend to use rather than own a particular transport mode has opened up new pathways to sustainable mobility.

A critical link exists between new technologies, services and transport decarbonization. In Syria, in some area we have to focus on policy and innovation by small changes to improve car technology rather than on integrated transport and mobility strategies. It is really big challenge.

TSPs in Homs have to get their systems ready and provide Apps that feed schedules, real time info as well as the ability to book & pay for services to MAAS operators.

Sustainable vehicle as the solution for taxis and public transport systems in the densely populated urban center of Homs that suffer from air-pollution should be a key focus for governments. The promotion of new, modern, cost-effective public transport systems and investment adequate transport infrastructure is key to promoting a safer and more efficient transport sector in Syria and could represent the easiest way to promote green transport modes.

Other policies include providing incentives for regular vehicle fleet renewals, regulating vehicle ownership and implementing user-friendly enforcements to use other cleaner modes of transport. More important,

however, is the effort made by the government to enhance the cultural and behavioral approach of individual citizens towards the use of more efficient and cleaner transport.

Despite efforts that aim at encouraging sustainable modes of transport, there are still many challenges that hinder the implementation of sustainable transport policies.

Means to enhance sustainability within the field of transportation is seen in the "Avoid-Shift-Improve" approach. This approach is based on the goals of sustainable transportation and shall be understood as a guideline for the development of such. Avoiding, Shifting and Improving are defined as follows: (Better Policies for Sustainable Development, A NEW FRAMEWORK FOR POLICY COHERENCE, 2016)

- Avoiding inefficient or unnecessary travel or transport, where appropriate, e.g. by improved and integrated urban planning, compact city form, transport demand management, less complex and extended supply chains, and e-communication options (mobile phone use, teleworking),
- Shifting travel/transport to improve trip efficiency through most efficient or environmentally friendly mode or combination of modes, capable of meeting the travel/transport needs, and/or shifting to off-peak travel, and
- Improving the environmental performance of transport through technological, operational, regulatory or pricing, and/or infrastructure improvements to make transport vehicles and equipment and the provision of transport more energy efficient and less carbon intensive.
- I made a table of recommendation and interaction between Lisbon and Homs, a successful and best practice that I can consider to applicate, not too much money but a good political vision in terms of future:

Lisbon experiences	Homs	Constrains
Integration with ticketing	It has to start MAAS.	The understating of new concepts and to be applicable.
Support of soft mode: walking and cycling	A practice can be started	The lake of soft transport infrastructure.
Public transportation much more tech-led	A practice can be started	This demands an appreciation Web principles and experiences in using

		strategic modeling [packages across modes.
Implementation of a taxation system based on on-board vehicle or among the road devices.		most of the Mediterranean countries had not yet introduced in their domestic legislation a modern corporate income tax system integrated with personal income taxes.
Development of pedestrian routes linking historical neighborhoods	A practice can be started.	We have to plan regarding to the strongly influence the walking activity are liveliness, safety, attractiveness, sociability, or the possibility to interact with buildings, activities, and other people (both stationary and moving).

We have to design a city with cars, not a city for cars, in many contexts, the car has a crucial function, efficient car travel in a major city requires people to make the majority of journeys by other modes of transport.

7.3 Future vision

- I studied the case of Lisbon, economically, environmentally, and geometrically, the idea is to benefit of their experience to be applicable in Homs in the reconstruction period, to have a good comfort efficient transport services, this is a requirement for us to build a good infrastructure to facilitate by means.

- The proposed future Plan is built around 5 networks (Walking, public transport, road, cycling) and 5 services (parking, shared transport, urban logistics, additional mobility, tourist transport) shaping the multimodal and intermodal transport system, bicycle is vehicle for change capable of transforming cities and providing a better quality of life, especially when cycling is fully integrated into local governance policies.

- Lisbon is filled with colourful narrow streets and built on a unique topography, it is undoubtedly a challenging city when it comes to mobility, so built on an integrated public transport network, for positioning Lisbon as the European capital of reference in the area of mobility by 2030.

- As we know Lisbon has a high rate of tourists, with a large income, so it is our responsibility to invest in the transport sector, and how can I secure a smooth and simple path for the tourist and enjoy their time during trips around Lisbon's land marks.

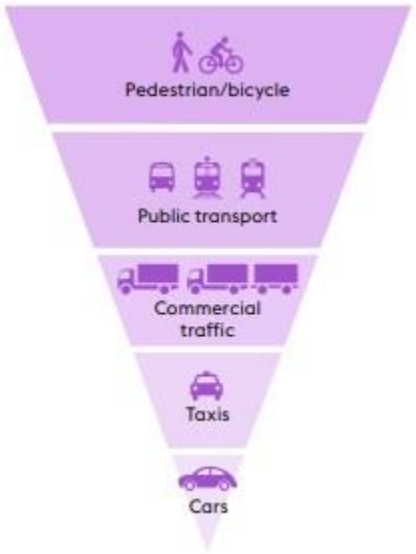


Figure 49: Future concept of transport modes
Source: Stockholm urban transport (Firth. D, 2012)

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